# Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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*Vol.11 No.7* *July 1958*

Fish and Wildlife Service
U.S. Department of the Interior
Washington D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE
ARNIE J. SUOMELA, COMMISSIONER

# Commercial Fisheries Abstracts

*Prepared in the Division of Industrial Research and Services*
***Bureau of Commercial Fisheries***

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| | | |
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| 0 General and theoretical | 3 Preserved fish | 7 Analytical Methods |
| 1 Fish by species | 4 Oils | 8 Composition |
| 2 Fresh fish | 5 Vitamins | 9 Miscellaneous |
| | 6 Fishery byproducts | |

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**Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.**

2.00 HANDLING AND CARE OF FRESH UNFROZEN FISH

Empey, W. A. (Division of Food Preservation and Transport, C.S.I.R.O., Homebush, N.S.W.)
Food Preservation Quarterly 18, 6-11 (March 1958)

Causes of fish deterioration.--The loss of quality in unfrozen fish, shellfish, and crustacea is caused by enzymatic or autolytic activity, oxidative reactions, and bacterial activity.

After death, the various parts of the fish are attacked by naturally occurring enzymes that tend to soften the tissues. In some cases, the enzymes derived from small crustacea in the gut are so active that the belly walls are ruptured and the visceral mass is converted into a semiliquid state within a few hours at ordinary air temperatures.

Enzymes derived from bacteria also are capable of breaking down the fish tissues and producing well-defined off-odors and flavors. An extremely rapid breakdown of flesh to produce a "milky" condition may be caused by the enzymes of certain protozoan parasites present in live fish.

"Blackhead" in prawns or "blackspot" in shrimp is due to the action of a naturally occurring enzyme that produces brown to black melanins from substances present in the blood of these crustacea.

Oxidative reactions cause rancidity of the fats. The atmospheric oxygen that causes this change also may bring about loss of aroma, flavor, and color.

Bacteria that occur on the skin, mouth, and gills and in the intestinal tract multiply and attack the fish tissues after death, and they form a variety of breakdown products that are largely responsible for the objectionable odors and taste of spoiled fish.

Onset and development of spoilage.--Spoilage, which does not begin until the fish have passed out of rigor mortis, is accompanied by changes in odor, appearance, and texture. Changes in odor are usually the first clear indications of deterioration. Fish fresh from the sea usually have a characteristic odor somewhat like seaweed.

The gills and slime on the skin of the fish generally show earlier and more pronounced odors

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 ABSTRACTER: Kathryn L. Osterhaug

2.00 SPOILAGE OF WHOLE FISH AND FILLETS

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 8-9 (1957)

A large proportion of the white fish caught by the British fleet is marketed in the fishing ports as fillets, the spoilage pattern of which differs from the spoilage pattern of the whole fish. Fillets cut from whole, ungutted fish that have been held in ice only a few days spoil in a different manner than fillets cut from fish that have been held in ice for longer periods of time. For example, fillets from haddock that were held in ice for only one day spoiled at about the same rate as did whole haddock; whereas fillets from haddock that were held in ice for 11 and 16 days spoiled more slowly than did those from whole haddock.

Effect of fillet treatment on spoilage.-- Studies were made on the effect of (1) washing fillets in tap water, (2) dipping fillets in antibiotic solutions of chlortetracycline or in antibacterial solutions of 1:6 di 4 chlorophenyl-diguanido-hexane or di-n-decyl-dimethylammonium bromide, and (3) wrapping fillets in polyethylene bags. All filletswere stored at 32° to 59°F. Washing the fillets for 5 minutes extended their storage life significantly over the storage life of unwashed fillets. Dipping the fillets in a solution that contained 20 p.p.m. of chlortetracycline for 5 minutes prolonged their storage life by as much as 2 to 3 days at 50° to 53.6°F. over the storage life of undipped fillets. Wrapping the fillets in polyethylene bags did not accelerate spoilage as judged by chemical and bacteriological tests or by the odor and flavor of the cooked fish. Immediately upon removal from the package, however, wrapped raw fish had strong odors that quickly disappeared.

Prepackaging of white fish.--Except for packages of kippers and kipper fillets, consumer packages of unfrozen fish are not commonly found. Previous studies at Torry Research Station have

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 ABSTRACTER: Martin Heerdt

2.1121 RATIONAL DESIGN OF FISHING GEAR

Lewis, A. J. (British Trawlers' Federation, Ltd., Grimsby, England)
Canadian Fisherman 45, 15, 17 (January 1958)

The design and development of British fishing gear have progressed less quickly than has the design of vessels on which the gear is used. Different methods have been tried from time to time, but the fishermen have usually gone back to their old habits. Attention is now focussed on the exact measurement of the net, particularly on the trawl doors, since it is from these that the actual catching of fish first starts.

All other parts of the gear should work in unison with the trawl doors. The board strops attached to the doors usually are 9 feet in length for a small door and 10 feet for the larger door. These strops must be exactly the same length with the same size of shackle attaching both ends of the strop to the trawl door. This also applies to the stopper at the end of the strop. The ground cable from the end of the strop to the wing of the net must be exactly the same length, size, and weight.

The form and shape of the net are taken from the arc of the headline. Particular attention is paid to the number and design of floats attached to the headline, especially in varying depths of water, and some skippers reduce the number of floats on the headline when they are fishing in depths of 200 fathoms. The top part of the net--such as square, top wings, and baitings--forms the main shape of the net and takes the most resistance. A net towed through the water at 3 knots allows the water to go through the meshes at a steady flow, but at 4 knots, a boil and disturbance of the water are created in the cod-end. These may damage the fish considerably.

Reaction and behavior of fish to gear.-- Opinions on this subject vary among British fishermen.

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 ABSTRACTER: Kathryn L. Osterhaug

2.116 ASDICS FOR FISH DETECTION I. AND II.

Haines, R. G.
World Fishing 6, 84-86 (October 1957)
World Fishing 7, 39-41 (January 1958)

Asdics are used for "echo-ranging" as distinct from "echo-sounding." The chief advantage of this type of equipment is that it provides a view around rather than only directly below. To be of value, the echo returned from the shoal must not only be of sufficient strength to be discernible but also must be identifiable for what it is.

As reports from commercial fishermen are still very scarce, the efficiency of the device is not fully known. It is obvious at this point, however, that adequate instruction on the use of this equipment and on the interpretation of the echo-traces received from it is necessary for effective application.

A directional pulse of sound travelling horizontally through the water is subject to effects that are not present when it is travelling vertically downward, as it is when echo-sounding. Differences of temperature, pressure, and salinity often cause the top and bottom parts of the beam to travel at slightly different speeds, which causes the beam to become bent and the energy to be scattered. This results in "reverberations," and can interfere with the receipt of the echo. Conditions for receiving the echo signal tend to improve as the depth of water increases.

Ultimately, the value of echo-ranging will depend on the skill of the fishermen in interpreting the echoes correctly. Echo-sounding has for many years made use of visual presentation rather than upon the actual sounds heard by the operator. Asdics have not yet reached the stage at which the

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 ABSTRACTER: Kathryn L. Osterhaug

HANDLING FRESH FISH

FILLET SPOILAGE STUDIES

FISHING GEAR DESIGN

ECHO-RANGING FOR FISH

suggested that the keeping quality of prepackaged fillets held at 32° F. was similar to the keeping quality of unwrapped fillets. These findings have been confirmed. Apparently no fundamental difficulties will be encountered in prepackaging fish and selling them in that form. The sale of prepackaged fish along with other commodities, therefore, may be practical.



than does the flesh. The development of off-odors of these parts does not necessarily mean that the flesh has begun to spoil, but it is of some value in predicting incipient decomposition. As spoilage advances, various off-odors described as stale, "fishy," sour, and putrid become apparent. In crustacea, and particularly in sharks and rays, strong ammoniacal odors are developed. In fatty fish, rancid odors may occur either alone or in conjunction with the more common spoilage odors.

The eyes of fresh fish have a bright transparent appearance and tend to protrude from the head, but as a fish becomes stale they become sunken and cloudy, particularly in the lens. The bright red color of the gills gradually fades to light pink and changes through yellow to brown. The transparent, almost water-white slime on fresh fish increases in volume as spoilage progresses and becomes turbid, thick, and frequently yellow.

It has been shown that bacterial activity is by far the most important cause of deterioration in fish, shellfish, and crustacea held at temperatures above freezing.

The factors that influence the rate of deterioration of fish are, in order of importance, temperature, sanitation, and miscellaneous physical agencies.

The flesh temperature of fish when caught is close to that of the surrounding water, but subsequently it approaches that of the surrounding atmosphere, unless refrigeration is used.

The activity of enzymes and the rate of chemical changes, such as oxidation, decrease with temperature, being halved by a fall of 18° F. Thus at 32° F. the rate of chemical changes will be about a quarter of that at 68° F. On the other hand, a fall of 18° F. in the temperature of bacteria reduces their rate of growth to approximately one-eighth. Thus bacteria that double their numbers in 1½ hours at 68° F. may require 12 hours to do so at 32° F. At 30° F., the time for one generation may be extended to 16 hours. Bacteria usually multiply by simple division, and a single organism will increase to approximately 1 million at the end of 20 generations.

Although a reduction of the initial bacterial contamination extends the storage life--particularly at the lower temperatures--the overall effect of temperature is of far greater importance. It can be calculated that prior holding of the fish at 68° F. will reduce the subsequent safe holding period at 32° F. by 12 hours for each generation that has taken place at the higher temperature.



loudspeaker can be dispensed with. When the difference between the echo and background is small, the echo often is heard before it becomes visible on the chart.

The echo-trace develops into the form of a sloping line, with the angle of slope depending upon the rate at which the range of the target is altering.

The characteristics of a fish shoal echo that helps to distinguish it from other unwanted echoes can be summarized as follows: (1) sharpness of the echo as heard in the loudspeaker, (2) extent of target (angle subtended, giving an estimate of size), (3) definite beginning and end of the echo as seen on the chart, (4) sharpness of edges or "cut-ons," (5) consistency and definition of echo trace, (6) range of loss of contact (giving an estimate of depth), and (7) separation from bottom profile trace (indicating that the target is not on the bottom).



One is that the fish are to some extent blind and cannot see where they are going. This temporary blindness may be caused by the clouds of sand created by the trawl boards and ground cables in front of the net. Another opinion is that most of the fish are caught when they are asleep and disturbed by the ground cables and trawl doors.

There is a good deal to say about these two opinions, for the greater the distance between the nets and the trawl door, the more disturbance is created and the more fish are caught. In other words, a net fitted with a 50-fathom cable will catch more fish than a net fitted with a 25-fathom cable. The choice of the fishing gear is made by the skipper. When fishing on a muddy or soft ground, he would choose a net made with a lighter size of twine and arranged with a manila or wire footrope. When on a rough ground, he would select a heavier but smaller net. Experiments have proved that a net fitted with a manila or wire footrope will catch more fish than will one fitted with wood or steel bobbins.

Choice of fishing gear.--Choice of fishing gear is usually governed by the type of vessel to which it is to be fitted. A vessel of 100 feet in length fishing in near waters is usually equipped with a small type of net made of a light twine. Small trawl doors, approximately 8 feet by 4 feet, are used with this type of gear, since they are much easier to pull along the sea bed and require less power than does the largest type net. Vessels of 100 to 150 feet use much heavier nets with trawl doors 10 feet 6 inches by 5 feet. The larger type vessels from 150 feet upwards use a still larger net--made of much heavier twine--because of its greater towing power, its ease in handling of larger quantities of fish, and its ability to stand up to all weather conditions.

Most skippers arrange their gear according to the nature of the sea bed at the fishing grounds they are going to fish. If the ground is rough or rocky, large steel or wooden bobbins from 16 to 22 inches are attached to the net, and a short length of ground cable is used. If the ground is reasonably good, a footrope or bassrope is attached to the net in place of the wood and steel bobbins, and a longer ground cable used.

2.116 CORRELATION OF MIDWATER TRAWL CATCHES WITH ECHO RECORDINGS IN THE NORTHEASTERN PACIFIC

Schaefers, Edward A. and Powell, Donald E. (U. S. Bureau of Commercial Fisheries, Fishery Technological Laboratory, Seattle, Washington)
Commercial Fisheries Review 20, 7-15 (February 1958)

Introduction and background.--Midwater trawls capable of fishing at any depth have been developed within the last decade. They have been used successfully to capture herring in Scandinavian and other European countries and in the inside waters of British Columbia. In addition to herring, other pelagic fish such as mackerel and anchovies are caught with this type of gear. The Larsen two-boat midwater trawl is probably the best known of those now in use.

Two of the major problems faced by commercial fishermen and research workers using midwater trawls are (1) locating and identifying schools of fish in midwater and (2) positioning the net at the proper depth to catch the fish. Experience has shown that few, if any, fish are caught by "blind" towing, and for good hauls, it is necessary to locate concentrations of known species of fish, determine their depth, and devise some accurate means of net positioning.

Summary.--Midwater trawling experiments, utilizing a fish finder (the "Sea Scanar") equipped with a prototype recorder, were conducted during the spring of 1956 off the coasts of Washington and British Columbia. Catches of fish and other marine organisms were identified from 66 midwater tows made by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel John N. Cobb. Trawl-fishing depths ranged from 10 to 213 fathoms over bottom depths of 15 to 950 fathoms. Catches varied widely, from no fish in a 60-minute tow to 5,500 pounds, mostly hake, in a 20-minute tow. Examples of "Sea Scanar" recordings made during the tows show types of traces for the various species caught, but with no fully consistent pattern. Traces of dense schools of hake are compared with others

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 ABSTRACTER: Kathryn L. Osterhaug

2.1471 IN OPERATING A DANISH SEINE NET IS STARBOARD OR PORT SIDE BEST?

Saito, Ichiro (Hokkaido University, Hokodate, Japan)
Canadian Fisherman 45, 11, 13, 15 (January 1958)

The one-boat medium trawl (seine) fishery was devised in Japan. A single boat of 15 to 75 gross tons draws the trawl net. In this method of fishing, the catch is made by scooping up the bottom fish by enveloping a sea-bottom area using a long towing warp (manila rope) and a fishing net that does not employ otter boards. One end of the towing warp is tied to a buoy, and the fishing boat sails her course paying out the warp of 3200 to 6400 meters in length as the net sinks into the water. The towing warp and net reach to the bottom, the boat begins hauling the two ends--keeping the wind and current astern--and thus the bottom fish are caught.

Japanese methods.--In Japan, the fishing gear is customarily operated on the port side of fishing boats, but the reason why this is done is not clear. In the early days of Japanese ships the "RO" (Japanese oar), which steers the boat, was set at the port side of the stern, so the fishing was also done from the port side; and even now, in modern times, when the ship is equipped with a propeller and rudder, the operation of the fishing gear from the port side seems to remain as a habit or custom.

Port side problems.--(1) In the case of hauling the net on the port side, the relation between the ship and net is shown in figure 2 (see over). (2) In the case of hauling the net on the starboard side of the ship, the relation between the ship and the net are as shown in figure 3 (see over).

For the seiner or one-boat medium trawler that must work in stormy weather in winter, the operation of fishing from the starboard side should be employed because the ship can turn in a small circle, and the net will not coil itself round the propeller.

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 ABSTRACTER: Kathryn L. Osterhaug

2.12 THE COMMERCIAL LONGLINING EXPERIMENT, ST. ANTHONY, NEWFOUNDLAND, 1955

Fleming, A. M.
Progress Reports of the Atlantic Coast Stations, Fisheries Research Board of Canada No. 68, pp. 9-13 (January 1958)

Introduction.--Longline fishing experiments in 1955 were designed to show that in the earlier part of the season, when inshore grounds are unsuitable for longlining, offshore deep-water cod grounds could be fished profitably; whereas in the later part of the season, inshore grounds close to port could be fished profitably. The Labrador current, in flowing southward off the east coast of Newfoundland, creates cold middle-layer water temperatures below 32° F. in the deep-water inshore areas that make them unsuitable for cod during spring, summer, and autumn. Near shore and at shallow depths a warm layer of water occurs in which the local fishery is carried on with traps, hand lines, and hand-hauled line trawls. Further seaward and below the cold middle layer, a warm bottom layer of water occurs. The best deep-water longline fishing for cod is generally found close to the junction of the cold middle and warm deep layers.

Boats, gear, and bait.--Two 55-foot Robar-type longliners, the Atlantic Rover and the Gertrude and Ronald, were chartered for the experiment. Each boat carried a crew of four men, and both boats began fishing on June 14. The Atlantic Rover finished fishing on October 25, whereas the Gertrude and Ronald finished on October 29. Eighteen-pound groundlines, 4-pound gangings, and 6/0 hooks were used. The gear was divided in tubs of twelve 50-fathom lines with approximately 50 hooks per line. Bait consisted of frozen herring and squid.

Fish catches--offshore and inshore.--Two- and 3-day fishing trips were made offshore. On a

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 ABSTRACTER: Richard L. McNeely

2.15 TECHNICAL NOTE NO. 43.--CONSIDERATIONS ON THE USE OF REFRIGERATED BRINE FOR CHILLING AND STORING FRESH FISH

Stern, Joseph (School of Fisheries, University of Washington, Seattle) and Dassow, John A. (Fishery Technological Laboratory, U. S. Bureau of Commercial Fisheries, Seattle)
Commercial Fisheries Review 20, 17-20 (February 1958)

The use of refrigerated brine or sea water for preserving fresh fish aboard a fishing vessel is increasing in commercial importance in the Pacific Northwest. This method of holding fish offers a number of potential advantages over the customary stowage of fish in ice. These include (1) greater speed of cooling, (2) reduced pressures upon the fish, (3) lower holding temperatures, (4) greater economy in handling the fish due to time and labor saved, and (5) longer effective storage life of the fish.

It is important to compare differences between the keeping quality of fish preserved by refrigerated brine and by ice. For this comparison, the temperature range of the fish in the brine must be similar to that of the iced fish. With proper icing, the temperature range of the fish varies from 32° to 34° F. English sole from a single haul were divided into two lots; one lot was heavily iced, and the second lot was placed in refrigerated brine (3 percent salt by weight) at a temperature ranging from 32° to 35° F. Examinations of these fish indicated that both lots remained in an edible condition for 13 to 16 days. Additional tests with English sole held in refrigerated sea water at 32° to 35° F. produced similar results. Brine or sea water, thus, appeared to have no special properties for extending the storage life of fish when the temperature of the fish held in brine was within the range of that of the fish held in ice.

From the viewpoint of keeping quality, the real advantage of refrigerated brine appears to be

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 ABSTRACTER: Kathryn L. Osterhaug

ECHO TRACES FOR TRAWLING

EXPLORATORY LONGLINING

OPERATING DANISH SEINE NET

HOLDING FISH IN BRINE

2.12

3-day trip 28 to 32 tubs of gear were fished. Water temperatures of 32° to 35.6° F., which are suitable for cod, were found in the 120 to 140 fathom depth about 35 to 40 nautical miles E.S.E. of St. Anthony. Catches averaging 1,000 to 1,200 pounds of cod per 12-line tub of gear were made in June. Catches averaging 800 to 900 pounds of cod per 12-line tub of gear were made in July when fresh caplin were used briefly as bait. Inshore fishing grounds extending from 2 to 15 nautical miles offshore between Cape Bauld and Cape St. Anthony were fished beginning in August. Eight tubs of gear were fished daily at depths of 30 to 50 fathoms. Catches in August averaged 900 to 1,000 pounds of cod per tub of gear. Catches in September and October were excellent with averages of 1,400 pounds of cod per tub of gear.

Financial returns.--Engine trouble and absence from the fishing area caused the Atlantic Rover to miss 16 days of fishing during which time the Gertrude and Ronald fished and caught 150,000 pounds of cod. The net man-shares were $1,229 for the Atlantic Rover and $1,653 for the Gertrude and Ronald. Higher returns would be available to local boats as they would have less expense than a chartered boat and could start fishing before June 14 and continue fishing until late December.

Cod sizes.--Cod caught by the longlines on the offshore grounds averaged 24 to 25 inches in length and 4.0 to 4.3 pounds in head-on gutted weight. Large cod over 34 inches in length and 10 pounds in weight accounted for 3 to 6 percent of the total catch. Market cod 22 to 34 inches in length and 2½ to 10 pounds in weight accounted for 86 to 87 percent of the total catch. Cod below 22 inches in length and 2½ pounds in weight accounted for 12 percent of the total catch in June and 7 percent in July. On the inshore grounds, cod averaged 26 inches in length and 4.8 to 5.0 pounds in weight during August, September, and October. Large cod, market cod, and small cod accounted for respectively, 6 to 8, 87 to 91, and 3 to 4 percent of the total catch.

Conclusion.--Well equipped longline boats could operate profitably from St. Anthony during the entire season by taking advantage of the offshore grounds. The inshore grounds were found so productive that the smaller boats equipped with cheap mechanical haulers could fish profitably with longlines beginning in August, after they had completed fishing with traps and handlines.

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that the brine temperature can be lowered to 29° to 30° F., or just above the point at which the fish begin to freeze.

Need for proper equipment.--To take full advantage of the potential of refrigerated brines, the user must give attention to the selection of equipment and its operation. Recent work in our laboratories with English sole, true cod, and sockeye salmon and in other laboratories with other species has indicated that difficulties may be encountered in the use of refrigerated-brine storage aboard commercial fishing vessels unless appropriate equipment is available and is operated in a proper manner.

It is possible to obtain and maintain the recommended temperature range by the use of properly engineered and operated refrigerated brine systems. With inadequate refrigeration, inefficient brine circulation, or poor thermostat control, however, the fish are in danger of spoiling, owing to the effect of brine temperatures above 32° F. If continuous refrigeration is not available in combination with adequate brine circulation, local "hot" spots may develop in the corners or at the bottom of the tank. Fish in these locations may deteriorate rapidly. A danger also exists if the refrigeration capacity is not adequate to maintain continuous low brine temperatures during periods of peak loading. In tanks lined with refrigerated coils, poor circulation may lead to excessive icing of the coils, which in turn lessens the efficiency of heat trasfer from brine to coils. Unrestricted, vigorous circulation of brine around the coils is essential at all times. If proper equipment and temperature control cannot be maintained to provide adequately low temperatures uniformly throughout the brine under all conditions of loading, the addition of crushed ice to the brine will be necessary to insure against loss of quality.

2.116

showing scattered patches of rockfish. Plankton forms, particularly euphausiids, were abundant and caused traces on the recorder that at first were mistaken for fish. With experience, a fair degree of success was attained in identifying echoes and predicting species in the catch.

2.1471

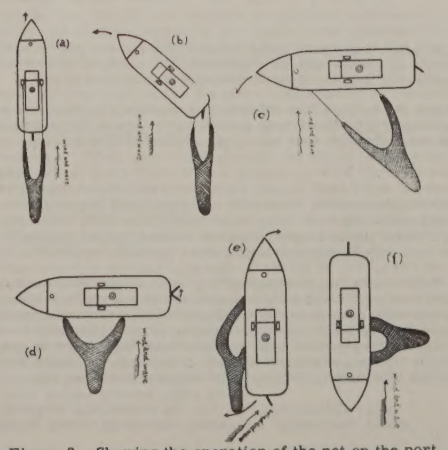


Figure 2. Showing the operation of the net on the port side and movement of the fishing boat.

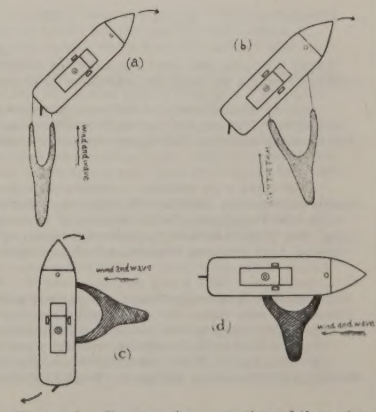


Figure 3. Showing the operation of the net on the starboard side and the movement of the fishing boat.

2.8 THE EFFECTS OF OVEN TEMPERATURE ON CERTAIN CHARACTERISTICS OF BAKED SALMON

Charley, Helen and Goertz, Grayce E. (Foods and Nutrition Department, Oregon State College, Corvallis)
Food Research 23, 17-24 (January-February 1958)

This paper reports an extension of a study made by the authors in 1952. The present study is concerned with cooking losses and palatability of large pieces of silverside salmon (Oncorhynchus kisutch).

Cuts of fish.--The fish varied in weight from 8 to 11 pounds. Each fish was divided into four parts of approximately equal weight. The first cut extended from the region of the pectoral fin and the gills half way to the dorsal fin. The second cut ended at the ventral fin and near the center of the dorsal fin. The third cut included the area from the center of the dorsal fin and the ventral fin to near the anus. The fourth section included the remainder of the fish to the caudal fin. The individual cuts for the eight replications ranged in weight from 651.5 grams to 1060.6 grams.

Baking.--The pieces of fish were placed on pot-roasting racks resting on shallow baking pans and were baked simultaneously in four household electric ovens at 350° F., 400° F., 450° F., and 500° F. Baked fish were removed from the oven when the internal temperature reached 158° F., and the rise in internal temperature after removal from the oven was noted.

Testing.--Cooking losses were measured, press fluid determinations were made, the samples were evaluated organoleptically, and the samples for histological sections were taken from both the raw and the cooked fish.

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 ABSTRACTER: Helen R. Groves

3.14 A LIVER PRESERVATION PROCEDURE

Guttmann, A. and Vandenheuvel, F. A. (Fisheries Technological Station, Halifax, Nova Scotia)
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations No. 68, 17-19 (January 1958)

Fish livers provide a favorable medium for the rapid growth of bacteria picked up from the viscera of the fish at the time the livers are removed. As the bacteria grow, they produce enzymes that cause spoilage. Lipolytic enzymes split the oil and produce free fatty acids, whereas proteolytic enzymes split the protein substances of the livers into a number of chemically more simple fragments. As a result of these actions the livers soften and eventually liquify.

Livers obtained from live fish are sterile; therefore, bacterial contamination after death must occur at the surface of the liver. If a bactericide or a bacteriostat is applied to the surface of the liver immediately after it is removed from the fish, the microorganisms that cause spoilage either will be killed or their growth will be retarded.

Experimental results.--Livers that were immersed in a bactericidal solution as soon as they were removed from the visceral cavity of the fish kept well. Any delay in the immersion of the livers in the bactericidal solution shortened their keeping time. Livers treated in very weak solutions of bactericide immediately after removal from the visceral cavity kept for days without appreciable spoilage even at room temperature. Livers that were held for several days could not be effectively treated to retard spoilage even if very strong bactericidal solutions were used.

A number of bactericidal compounds were tried, and these compounds as well as the medium in which they were dissolved were found to be effective in delaying spoilage. The most effective

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 ABSTRACTER: Martin Heerdt

OVEN TEMPERATURE FOR SALMON

PRESERVATIVE FOR FISH LIVERS

3.17 PRESERVATIVE ICE FOR WHITE FISH

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 6-7 (1957)

Introduction.--Previous studies in Great Britain and Canada indicate that ice that contains small amounts of chlortetracycline (CTC) has an outstanding preservative effect. In vitro tests also have indicated that a diguanide compound (1:6 di 4: chlorophenyl-diguanido-hexane) and a quaternary ammonium compound (di-n-decyldimethylammonium bromide) are almost as effective as CTC against pure strains of fish-spoilage bacteria. The above two compounds, when incorporated into ice that was used for icing white fish, were inferior to CTC even at concentrations as great as 5 to 30 times that of CTC. Laboratory studies have indicated that oxytetracycline ice is as favorable for extending the storage life of white fish as is CTC ice.

Experiment 1.--Laboratory findings were extended to include large scale studies aboard the research vessel, Sir William Hardy.

In experiment 1, whiting, haddock, codling, and mixed flat fish caught off Aberdeen, Scotland, were iced on board in ordinary ice and in ice containing about 5 p.p.m. of CTC. On the day of landing, lots of fish were available that had been stored in each type of ice for periods ranging from 8 to 24 days. Each lot was examined by organoleptic, chemical, and bacteriological methods; and the antibiotic residual in the fish was determined.

Results with experiment 1.--The effect of the antibiotic for extending the storage life of fish was noticeable only after the 10th to 12th day of storage in ice. If the limit of edibility is 14 to 16 days in ordinary ice, then these limits could be extended to 21 to 26 days with antibiotic ice. In

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 ABSTRACTER: Martin Heerdt

3.18 ULTRAVIOLET IRRADIATION OF SEA WATER FOR FISH CANNERIES

Rowan, M. K.
Fishing Industry Research Institute Progress Report No. 30, Fishing Industry Research Institute, University of Cape Town, Rondebosch, South Africa

Water used for soaking rock lobster tails before packing should be free from clostridia and other sporing organisms that may be present in the sea water. Methods for purifying sea water were investigated. Chlorination was the first method to be considered. Clostridium welchii and other naturally occurring sporing bacteria, however, were so resistant to high concentrations of chlorine as to make this method impractical. Filtration was also investigated, but the high initial outlay and operating costs of an efficient plant proved to be excessive.

The Institute now is able to report on an electrically operated device for sterilizing water by ultraviolet irradiation. This equipment appears suitable for use in rock lobster canneries and, indeed, at any point in any fish-processing plant where relatively small amounts of purified water are required.

Equipment.--The water sterilizer tested consists of a horizontal copper shell, about 20 inches long by about 4 inches in diameter, with a small observation window and detachable end covers, in one of which there is a mounting for the ultraviolet element. Diametrically opposed tappings for 1½-inch pipes are arranged near the ends of this chamber. Water passes along the treatment chamber with a swirling motion imparted by the arrangement of the inlet and outlet. The inner surface of the chamber is chromium-plated to give both internal reflection and resistance to corrosion.

The ultraviolet lamp is a high-pressure mercury arc tube, housed in a quartz cylinder that is supported along the center line of the treatment chamber. The lamp has an effective length of 9 inches between electrodes, and the annular cross section between the quartz cylinder and outer metal wall is equivalent to 9.8 square inches. Thus, at the maker's recommended flow-rate of 1,500 gallons

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 ABSTRACTER: Kathryn L. Osterhaug

PRESERVATIVE ICES FOR FISH

WATER PURIFICATION

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bactericidal solution, when applied to fresh livers shortly after they were removed from the fish, was made in 100-gallon lots from 1.75 pounds of methyl parasept, 2.25 pounds of butyl parasept, 33 gallons of isopropanol, and 67 gallons of water. Livers were covered with this solution by using one volume of solution to ten volumes of livers. Using 45-gallon drums, the recommended quantity of solution was placed in the bottom of the drum and the livers were added one-pail-full at a time. When using large containers, solution and livers were added alternately until the container was full. One gallon of this antiseptic costs about 40 cents, and this amount is enough to treat 10 gallons of fish livers.

Keeping time.--Livers treated as recommended with the above solution kept for 2 weeks at 70° F. At the end of this period some softening was noticeable and a 2 percent increase in the free fatty acids content of the liver oil had occurred. This amount of change is about the same as the amount of change that takes place when livers are held 3 to 4 days in ice. At temperatures below 70° F. the solution extended the storage period for more than 2 weeks.

Livers held in a 500-gallon tank with the recommended solution aboard a trawler where the temperature never fell below 70° F. arrived in very good condition at the end of 10 days. No difficulty was encountered in rendering these livers for the recovery of the liver oil or in separating the oil from the residue. A part of the isopropyl alcohol used in the antiseptic solution appeared in the liver oil and was removed by the hot-water centrifugation normally used in recovering the crude liver oil.

Isopropanol that remained in the liver residue was removed by evaporation during the process of drying the residue in a drum drier. Liver meal of good quality and with good appearance was obtained. This liver meal contained all of the parasept used in the bactericidal solution. This amount of parasept, however, was not objectionable because parasept in small amounts is an accepted food preservative,which increases the storage stability of liver meal.

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Results: Average baking time decreased from 36 minutes per pound at 350° F. to 24 minutes at 500° F. The amount of body cavity in the 4 sections affected the size and shape of each piece, and the configuration, in turn, influenced the rate of heat penetration. The third cut from each fish was the most compact and required a somewhat longer baking time than did the other cuts. The first cut, which came from nearest the head of the fish and which had the largest body cavity, required the shortest baking time per pound.

Shrinkage of the meat and blistering of the skin were markedly less at the lower than at the higher oven temperatures. The oven required extensive cleaning when the fish were baked at the higher oven temperatures, whereas little or no cleaning was needed after baking at the lower temperatures. These disadvantages to using the two higher oven temperatures were more marked for the large cuts of salmon than they were for the one-inch salmon steaks.

A 100° F. increase in baking temperature resulted in a significant increase in evaporation and in total cooking losses. Evaporation and total cooking losses were less for the fourth cut than for the other three. In addition, evaporation, drip,and total cooking losses differed significantly from fish to fish. Whereas the amount of fat and the disintegration of muscle fibers as studied histologically differed among fish as well as among parts of fish, the baking temperature had no effect on the histological appearance of the cooked salmon. Oven temperature had no effect on the amount of press fluid or on the palatability ratings of the baked salmon. Differences in certain palatability characteristics of the baked fish were associated with the part of the fish. The cut nearest the head ranked highest in flakiness and lowest in tenderness, whereas that from the tail was least flaky but most tender. Histologically, the tail cut contained the least number of kinks and twists and the greatest degree of disintegration of muscle tissue; the opposite was true for the cut nearest the head. The cut from the third quarter was ranked highest for flavor and over-all desirability, whereas the cut from the head end was ranked lowest in these characteristics.

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per hour, the irradiated volume at any moment is 0.32 gallon, and the time of exposure is 0.76 second.

The first tests with the sterilizer were carried out in 1954 to 1955. As indicators of its bactericidal efficiency, presumptive coliform counts and routine plate counts were made on samples of water drawn during operation at the inlet and outlet of the apparatus.

Although bacterial spores were usually more resistant to the effects of ultraviolet radiation than were their vegetative forms or nonsporulating bacteria, the writer was encouraged to hope that the sterilizer might be employed against sporing bacteria in sea water. Accordingly, a second series of experiments was carried out with use of the sulphite-reducing anaerobic spore-formers, which include Clostridium welchii, as the indicator organisms.

The results of this second series of tests may be summarized as follows: (1) With sea-water samples having initial presumptive counts of 1200 to 1800 coliforms per 100 milliliters, passage through the apparatus reduced the count to nil. (2) The total number of bacteria in the same sea-water samples, as measured by nutrient agar plate counts (incubated at 37° C. for 48 hours) and sea-water-agar plate counts (incubated at room temperature for 4 days), was reduced by irradiation by 98 to 99.9 percent. (3) The number of spores of anaerobic sulphite-reducing bacteria, occurring naturally in sea water, was reduced by 92 to 100 percent on passage through the apparatus. (4) The above effects were observed in sea water in which the turbidity varied from 6 to 15 p.p.m. (silica scale). (5) Visible suspended particles in the sea water appeared to have an adverse effect on bactericidal efficiency, the percentage kill being lowest in the tests in which these were not removed by some simple type of filter. (6) In heavily polluted fresh water with a pronounced yellow color, flow-rate also appeared to affect the percentage kill, this being highest at a rate of 10 gallons per minute and lowest at a rate of 20 gallons per minute.

Essential precautions.-- Several practical considerations limit the application of ultraviolet radiation to the disinfection of water supplies: (1) Sources of ultraviolet light deteriorate during use so that frequent estimates of the ultraviolet-light output must be made by means of bacteriological tests. (2) A considerable amount of ultraviolet radiation is cut off if the quartz tube becomes cloudy or fouled. (3) Ultraviolet rays cannot penetrate turbid water. (4) Water treated with ultraviolet light does not carry a residual germicidal compound.

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addition, the quality of smoked fish made from lots of fish stored for 18 to 21 days in antibiotic ice was equal to the quality of smoked fish made from lots of fish stored only 6 days in ordinary ice.

Experiment 2.--In experiment 2, a 15-ton lot of fish landed by the research vessel, the Sir William Hardy, off the Faroe Islands, was stored in antibiotic ice that contained 2 to 3 p.p.m. of CTC. Haddock, codling, and mixed flat fish stored in antibiotic ice for periods ranging from 14 to 28 days were landed on 3 successive days at Aberdeen, Grimsby, and Hull. Members of the fishing trade were invited to express their opinions of the quality of fish stored in ordinary ice and antibiotic ice.

Results with experiment 2.-- The fish trade and the trawler owners in particular, were favorably impressed; however, the results were not as spectacular as were the results obtained in the first experiment. Similar results were obtained on board a distant-water trawler owned by a commercial firm.

Concentration of antibiotic.--Cod that were stored continuously in ice containing 5 p.p.m. of CTC concentrated 3 to 11 p.p.m. of CTC in their skins and less than 1 p.p.m. of CTC in their flesh. When this cod was steamed in a casserole for 35 minutes, no CTC remained even in the skin. When this cod was deep-fat fried for 7 to 10 minutes at 482° F., up to 4 p.p.m. of CTC residue remained in the skin.

Antibiotics have not been approved for use with fish in the United States.

3.19 PACIFIC COAST PROGRAM ON THE IRRADIATION PRESERVATION OF FISH--PHASE REPORT

Miyauchi, David T. (Fishery Technological Laboratory, U. S. Bureau of Commercial Fisheries, Seattle, Washington)
Commercial Fisheries Review 20, 16-17 (February 1958)

On the Pacific Coast, the potentialities of using nuclear radiation for the preservation of fish are being studied at the Seattle Technological Laboratory and, under contract with the U. S. Bureau of Commercial Fisheries, (1) at the Department of Food and Dairy Technology, Oregon State College, and (2) at the Food, Chemical, and Research Laboratories, Seattle, Washington.

The present study is primarily a screening operation to select, for possible initial commercial utilization, those species of fish and shellfish that are most adaptable to this new method of preserving food. Two of the possible applications of irradiation to fish preservation being investigated are (1) use of ionizing radiation alone for "cold sterilization" and (2) use of lower levels of ionizing radiation in combination with some conventional method of processing for "radio pasteurization."

All fishery products used are irradiated at the Materials Testing Reactor Gamma Irradiation Facility at Idaho Falls, Idaho. The product to be irradiated must be packed in hermetically sealed cans. These cans are placed in a rack that is lowered into a pool of water about 16 feet deep adjacent to spent fuel elements, the source of gamma rays. After being irradiated, each can is checked for radioactive contamination before being returned to the research laboratories.

For determination of the maximum level of dosage possible before radiation-induced flavors and odors become objectionable, cod fillets were irradiated at levels of 0.23, 0.47, 0.70, 0.93, 1.4, and 1.9 megarads. (A rad is an absorption of 100 ergs per gram of material. A megarad is a unit 1

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ABSTRACTER: Kathryn L. Osterhaug

3.2383 ZIP-OPEN PAN PACKAGE

Anonymous
Modern Packaging 31, 108-109 (April 1958)

A new frozen fish product in a zip-open cook-in package has been developed by a firm in Gloucester, Massachusetts. The product consists of a 6-ounce fillet of fish prepared with melted lemon butter, paprika, parsley, and salt to make a premium product. The container is an ingenious package combination of pouch-tray, carton, and overwrap.

The fillet is enclosed in a special foil-paper pouch, measuring 9½ by 4 inches. In the packaging operation, the base of this two-piece container is "drawn" around the product to form a shallow pan. The top sheet has a 1-7/8 by 7-inch perforated, rectangular, tear strip in the center that is removed before the product is cooked. The individual portions of fish may be either baked or broiled in the pan-package and taken piping hot to the table for serving.

The pouch is constructed from 0.00035-inch foil mounted on a 25-pound paper coated with 1 mil of polyethylene for sealability. A ½-pound vinyl overcoat on the outside foil surface prevents scuffing and protects the printed cooking instructions.

The carton is of standard lock-tab design and construction, and is made of wax-sized 0.015-inch solid, bleached, kraft paper. Two pouched fillets are inserted in each carton to give a net weight of 12 ounces.

The overwrap consists of a triple lamination of 0.00035 foil, glue-mounted to 15-pound tissue that is, in turn, wax-mounted on 8-pound tissue. A vinyl overcoat also is used here to protect against scuffing.

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ABSTRACTER: Kathryn L. Osterhaug

3.237 INFRARED PROCESSING IS REALLY CATCHING ON

Anonymous
Food Engineering 30, 110-114 (February 1958)

Cooking with infrared radiation, in contrast to conventional cooking, has considerable appeal because foods cook faster, retain more moisture, and are under instant heat control. Savings in floor space, maintenance of sanitation, and removal of combustion products also result from processing with infrared radiation. Sugar, macaroni products, grated codfish, potatoes, wheat germ, bread crumbs, and other foods have been successfully dried with infrared radiation. Cooking with infrared radiation, however, is far more difficult than drying with infrared. Until recently most attempts at cooking were unsuccessful.

The recent development of quartz-envelope lamps for the production of infrared radiation has caused food processors to re-evaluate this method of processing. These new lamps produce temperatures up to 1,500°F. from tubes or bulbs of heat-resistant quartz rather than from glass. Quartz does not soften until it reaches a temperature of 3,000°F., therefore it is possible to enclose the filament in a small diameter tube and to operate the lamp at very high ambient temperatures. Several lamps mounted in a small space will produce a high concentration of radiant energy. Successful food processing requires that these infrared units be operated at temperatures sufficiently high to generate the short infrared waves that are vital to proper color development.

Basic factors.--Infrared radiation is a transfer of energy by electromagnetic waves of varying length. Infrared radiation ranges in wave length from relatively short visible waves to very long radio waves. The energy contained by these waves depends upon their wave length. Cooking with infrared radiation requires a proper balance between the quality and the quantity of energy supplied.

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ABSTRACTER: Martin Heerdt

3.24 QUALITY AND TEMPERATURE ALL ALONG THE LINE ARE "MUSTS" IN FROZEN FOOD INDUSTRY

Diehl, H. C.
Industrial Refrigeration 134, 13-15 (March 1958)

Perishability of frozen foods is their greatest asset, as well as their most troublesome deficiency. The very fact that frozen foods are so perishable in relation to environment, notably temperature, is, in a sense, also the reason for their desirable qualities. The basic reason for success of frozen foods is that they consist of product quality protected by continuously adequate refrigeration.

An industry is made possible by the merchandising of either products or services. The Frozen Food Industry sells product; and it is quality, convenience, nutritional properties, eye appeal, and appetite appeal of product that make this industry possible. When a product is too often or too greatly abused by carelessness or ignorance of essential facts, therefore, that product will ultimately fail to hold its place in the public interest, no matter how attractive the advertising, no matter how clever the merchandising gimmick, no matter how initially promising the newness of its potential market.

Realities of life always catch up with the deeds or misdeeds of people. People also remember unpleasant experiences longer and more acutely than they do pleasant ones, and they seldom subject themselves to an unpleasant experience a second time. Frozen foods have a memory for good and bad treatment. Not all frozen foods have the same sensitivity to temperature change.

A type of quality degradation that still is all too frequent results from abuse to frozen foods in the pipelines of food distribution. This type of quality degradation results from a succession of

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ABSTRACTER: Kathryn L. Osterhaug

IRRADIATION OF FISH

INFRARED COOKING OF FISH STICKS

COOK AND SERVE FILLET PACKAGE

FROZEN FOOD QUALITY CONTROL

3.237 (Cross Reference: 2.8)

Only with this balance can the desired appearance, texture, and flavor of product be obtained. Long wave infrared radiation can be used to cook food; but only the shorter wave length infrared radiation, preferably below two microns in wave length, is effective for developing color. For best results, infrared radiation heat elements should operate at color temperatures in the range 2,200 to 3,300° F. to produce the necessary short waves. The braising of meat and cooking of hamburgers are typical cooking processes that are relatively easy to control with respect to product appearance and degree of cooking.

Items such as fried chicken and fish sticks, which are covered with batter and breading, have a relatively waterproof coating--particularly when they are treated with oil. Batters and breadings must be carefully balanced to produce the desired color and flavor in fish sticks, otherwise they will range in color from pale honey to dark caramel. Conversion to infrared cooking from deep fat frying will produce a product with a new flavor and a new appearance. These effects may be minimized by formula revision, or the new process may be modified so that the old ingredients yield a reasonable facsimile of the original appearance of the fried product. For these reasons, it is wise to reserve radiant cooking for new foods about to be introduced.

Application to fish sticks.--Fat absorption is minimized when fish sticks are cooked with infrared radiation. An infrared cooker available for this purpose consists of a conveyor section, an oil sump, radiant lamps, blowers, and hoods. Two banks of infrared lamps are mounted on angle iron frames so that their height above the conveyor belt can be adjusted. Each bank holds eighteen 3,800 watt lamps. In this cooker, the fish sticks pass through a curtain of cooking oil and under a bank of infrared lamps. Then the fish sticks are turned over and allowed to pass under a second curtain of oil and under a second bank of lamps. Excessive oil is screened and recirculated by a pump to the slotted pipes that are placed over the belt. A centrifugal blower is used to exhaust fumes and excess hot air through two hoods placed over the cooking belt.

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people--from producer to consumer--carelessly or ignorantly assuming that when frozen foods warm up here and there, it doesn't matter, as long as the product temperature is brought down to 0° F. again.

Even at 0° F., some changes slowly occur. That specific temperature is a practical compromise, although there is presently a tendency to seek lower commercial storage temperatures. It must be remembered also that the quality of a frozen food cannot be any better than that of the original food before it was frozen. Hence, although temperature and packaging protection are stressed, responsibility of the packer for maintenance of quality cannot be ignored.

Frozen foods have a memory. Every misdeed affecting the quality of frozen food is accumulated in the product. Producer, transporters, warehousers, distributors, and retailers all have joint responsibility in these matters. The industry, too, should have memories of past experience. Every time the industry fiddles with the quality of frozen foods, whether by initial disregard or subsequent environmental misdeeds, its gambles with the future of the industry. Industrial sales currently are growing, but is it not true that they are increasing presently more in relation to growth of population than in a manner that would indicate increased acceptance by the public? If this is so, it is important that the industry determine the reason. Frozen foods have a memory; the consumer has a memory, too!

Almost 7 years ago, there came into being the USDA Time-Temperature-Tolerance investigations. This unique research enterprise has cost nearly two million dollars. Reports are in technical language, as they must be, but they hold the prescription for the success of the frozen foods industry. Until these prescriptions are used in practical application, there will be no results.

It has long been evident that the Frozen Foods Industry--by some form of intelligent cooperation--must, in its own interest, give more consistent support and interest to those scientific investigations (Federal, trade, and industrially-endowed) that have a vital effect on its present and future.

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million times as large.) Although some radiation odors and flavors were detected in all samples, their intensity generally increased with the level of dosage. The borderline of permissible dosage as judged by the organoleptic acceptability of the fillets appeared to lie between 0.93 and 1.4 megarads.

Cod fillets were irradiated at dosage levels of 0.23 and 0.70 megarads to determine their approximate storage life at 32° F. The 0.23 megarad samples had a storage life of about 56 days in ice, and the 0.70 megarad samples had a storage life of about 112 days in ice. In contrast, the unirradiated samples had a storage life of 10 to 15 days in ice.

In experiments now in progress, cod fillets were irradiated at either 0.1 or 0.2 megarads to determine their storage life at 35° F. Evaulations of quality are being made by means of organoleptic, chemical, and bacteriological tests. The results will be reported at the conclusion of the tests.

3.2383

As the frozen fillets travel down the production line, the coating of butter and lemon juice is added with spray nozzles that are accurately supplied with the mixture both by pump and by air pressure. The salt and parsley are sprinkled on by ingenious dribble feeders. Paprika is applied from a hopper that contains a rotary spreader.

An operator transfers the coated fillets into the pouch machine's feed pockets, which draw the fillet into the throat of the machine and sandwich it between two roll-fed strips of the foil laminate. As the fish enters the machine, it is spotted on the foil with the rear edge of the fillet directly under the rear of the 7-inch perforated tear strips. This permits the consumer to get a better grip on the strip and facilitates opening the package.

4.90 PHOSPHOLIPIDS 5. THE EFFECT OF COD-LIVER OIL IN THE DIET ON THE COMPOSITION OF HEN'S EGG PHOSPHOLIPIDS

Rhodes, D. N.
The Biochemical Journal 68, 380-384 (February 1958)

The object of this work was to ascertain whether or not the highly selected deposition of unsaturated and saturated fatty acids in the $\alpha$ and $\beta$ positions of hen's egg-yolk phospholipids would persist when a high proportion of fish oil, rich in polyethenoid acids, was included in the diet.

The results of the work is given in the author's summary, as follows: (1) The addition of 10 grams of cod-liver oil per day to the diet of a laying hen increased the unsaturation of the neutral fat and more particularly of the phospholipids of the egg yolk. (2) The increases in unsaturation of the egg phosphatidylcholine and phosphatidylethanolamine were confined entirely to the fatty acids esterified in the position of the glycerophospholipids, the $\beta$-acid remaining mainly saturated. (3) The polyethenoid acids of the fish oil were selectively incorporated into the phospholipids apparently at the expense of the monoethenoid and diethenoid acids normally present. An average unsaturation of 4.8 double bonds per molecule was reached in the $\alpha'$-acids of phosphatidylethanolamine.

In table 1 is shown the effect of feeding 15 grams of cod-liver oil per day on the unsaturation of the hen's egg lipids.

See table 1, over.

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ABSTRACTER: Edward H. Gruger, Jr.

4.91 THE INFLUENCE OF DIETARY FATS ON SERUM-LIPIDE LEVELS IN MAN

Ahrens, Edward H. Jr.; Hirsch, Jules; Insull, William, Jr.; Blomstrand, Rolf; Tsaltas, Theodore T.; and Peterson, Malcolm L. (The Rockefeller Institute, New York, New York)
Journal of the American Oil Chemists' Society 34, 563-570 (November 1957)

Evidence is mounting that the precise chemical composition of ingested fatty acids may have significance in health and disease. Recent clinical investigations suggest that levels of serum-lipides may be related to dietary intake of unsaturated fatty acids.

The authors have been studying effects of dietary fats on patients for three years. Liquid formulas have been fed orally. Recognized extra-dietary factors that influence serum-lipide levels were kept to a minimum. Dietary intakes were simplified and rigidly standardized. All known requirements were included. Weekly measurements were made of total and free serum-cholesterol, total serum-lipide phosphorus, and total serum-lipides. Cholesterol esters and serum triglycerides were calculated.

Several natural fats were fed and the resulting levels of serum lipides were determined. Results were related to characteristics of the fat, such as iodine number and linoleic acid content. A roughly linear relationship existed between iodine values and percentage differences in cholesterol or phospholipide levels. Fats with iodine values over 100 produced equally low levels of cholesterol. Fats with iodine values under 90 resulted in increased cholesterol as saturation increased. At this time, however, the interpretation can not be made that the effect on serum cholesterol and phospholipide levels is strongly correlated with iodine value of dietary fat. Fatty acids of short and intermediate chain length apparently cause higher lipide levels in the serum than do long-chain saturated acids.

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ABSTRACTER: Neva L. Karrick

4.91 ESSENTIAL FATTY ACIDS

Holman, Ralph T. (University of Minnesota, Austin)
Nutrition Reviews 16, 33-35 (February 1958)

The importance of certain fatty acids was demonstrated by the work of Burr and Burr in 1929. Their work, and that of subsequent investigators, showed that the rigid exclusion of fat from the diet of rats induced cessation of growth, scaliness of skin, kidney damage, and impaired reproduction. All of these abnormalities can be prevented or cured by feeding supplements of less than 100 mg. of linoleic or arachidonic acids per day per rat. Early reports suggested that linolenic acid was equivalent to linoleic in preventing these abnormalities. More careful experimentation, however, has revealed that linolenic acid merely stimulates the growth of fat-deficient animals instead of curing their dermal symptoms. Mice, guinea pigs, rabbits, dogs, cattle, swine, and even insects are among the wide range of animals that have been shown to require essential fatty acids.

The term essential fatty acids should include only those substances that are active both for growth and for maintenance of dermal integrity. This terminology limits the essential fatty acids to linoleic and arachidonic acids and to such other acids as may be derived metabolically from them. All of the common polyunsaturated acids appear to be related to, or derived from, linolenic, linoleic, or oleic acids, and they fall into three groups or families depending upon the structure of their molecules. Essential fatty acids are required for maintenance of a variety of biological functions. Deficiency results in diminished growth, impaired reproduction, and structural changes in many tissues. Histological changes in the skin of animals deficient in essential fatty acids are accompanied by markedly increased water permeability. Kidney structure may become so deranged that hematuria results.

Recently the essential fatty acids have been implicated in the problem of atherosclerosis. Although it is not known if hypercholesterolemia is a cause of atherosclerosis or of myocardial infarction, it is considered to be an undesirable indicator of potential disease. The inclusion of high levels of

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ABSTRACTER: Martin Heerdt

6.1 FISH BYPRODUCTS

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 19-20 (1957)

Quality assessment of meal. --Fish meal is used as a source of high-quality protein to supplement animal feedstuffs. Fish meal is known to vary in quality; therefore, its nutritional value should be evaluated before it is sold and used. The problem of practical methods of evaluating fish meals is part of a larger problem in the use of protein supplements in general. Protein supplements include, in addition to fish meal, oil-seed cakes, milk products, meat meals, and bone meals.

Rapid and reproducible techniques for the assay of fish meal should be correlated with biological or feeding assays of these meals. The Agricultural Research Council has set up a work party that represents producers, users, and research institutes including the Torry station to evaluate these protein meals. Two methods that show promise and are being studied at Torry station are (1) the binding of the meal with an acidic dyestuff, orange G, and (2) the reaction of the meal with 2,4-dinitro-1-fluoro-benzene. Both methods of assay are believed to measure the available lysine content of the meal. Lysine is the limiting amino acid in the rations of typical British farm animals.

Effluent odors from byproduct plants. -- Practical means for reducing the offensive odors that emanate from herring meal factories are urgently needed. Funds have been made available by the Scottish Home Department, the Herring Industry Board, and private industry to make an intensive study of the effluent odors emanating from fish meal factories. A laboratory scale, continuous fish-meal drier has been designed for use in this study. This drier will supply contaminated air of constant odor-strength and quality for the experimental studies concerned with practical methods of reducing effluent odors.

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ABSTRACTER: Martin Heerdt

COD-LIVER OIL FOR HENS

ESSENTIAL FATTY ACIDS

EFFECT OF OILS ON SERUM LIPIDES

FISH BYPRODUCTS

4.91

saturated fat in the diets of animals and humans induces hypercholesterolemia, whereas diets containing a high level of unsaturated oils containing large proportions of essential fatty acids depress the level of plasma cholesterol.

A relationship of essential fatty acids to cholesterol transport in the blood stream also has been demonstrated. Conditions that are accompanied by hypercholesterolemia, such as administration of dietary cholesterol, alloxan diabetes, or hypothyroidism were found to accelerate essential fatty acid deficiency in rats. This finding suggests that the composition of circulating lipids must remain reasonably constant. To transport large amounts of one component of a lipid mixture, an animal would need to synthesize or release from his tissues matching quantities of the other components. If the transport of cholesterol or nonessential fatty acids is increased (1) by the inclusion of large quantities of these compounds in the diet or (2) by some form of stress, this increase will require the release of polyunsaturated acids from the tissues for incorporation into the cholesteryl esters and phospholipids, which are constant components of the blood plasma lipid.

The general, metabolic patterns in humans are the same as those in animals; therefore, humans need the essential fatty acids. Dermal abnormalities in adult humans that received low-fat diets have not been demonstrated because these experimental studies were of too short a duration, the diets were not rigidly free of essential fatty acids, and a normal adult human usually has more than a pound of linoleic acid stored in his body when placed on the diet. Hansen and Wiese in 1957 demonstrated conclusively that essential fatty acids were required by infants when they showed that skin lesions induced by feeding low-fat diets to infants responded to the oral administration of linoleic acid.

Linoleic and linolenic acids, which are the precursors of the more highly unsaturated acids in animal tissues, are found in abundance in the common vegetable oils. The more highly unsaturated acids are found only in animal tissues. The fats of fish oils and glandular tissues contain a large amount of polyunsaturated acids.

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Fish-meal pilot plant. -- The performance of conventional steam-heated fish-meal plants is influenced by several factors. Capacity of the fish-meal pilot plant at Torry station was increased 1 percent by each increase of 1 pound per square inch gauge steam pressure throughout the range, 10 to 35 pounds per square inch gauge. The disposal of most of the exhaust vapor ducts was found possible, and only 1 or 2 of the ducts near the feed end of the plant were retained. Elimination of most of the vapor ducts did not adversely affect plant capacity. On a commercial scale, the removal of these ducts, which are prone to corrosion, would bring about a considerable saving in their maintenance and repair.

4.90

Table 1.--Effect of feeding 15 grams of cod-liver oil per day on the unsaturation of the egg lipids

| Days on diet | Iodine value of neutral fat | Total lipid phosphorus | Number of double bonds per atom of phospholipid (unsaturation) | | |
|---|---|---|---|---|---|
| | | | Total phospholipid | Phosphatidyl-choline | Phosphatidylethanolamine |
| Days | | Mg. | | | |
| 0 | 72.6 | 61.0 | 2.33 | - - | - - |
| 7 | 78.5 | 72.2 | 2.87 | - - | - - |
| 15 | 84.7 | 68.2 | 3.04 | 2.70 | 4.79 |
| (27, 28, 30) (32, 34, 35) | 86.7 | 340 | 3.15 | 2.71 | 4.81 |

4.91

The hypothesis that serum lipides can be lowered by ingestion of highly unsaturated oils is supported by the following points: (1) Feeding tests suggest that the major influence on serum-lipide levels is due to the glycerides, not the nonsaponifiable fraction. (2) The serum-lipide levels were directly related to the degree of saturation of the glyceride fatty acids as measured by the iodine value of the fat. (3) Use of hydrogenated corn and cottonseed oils resulted in higher serum-lipide levels than when the corresponding unhydrogenated oils were fed.

It is not known at present whether the effect of dietary fat is more dependent on mean unsaturation of the fed fat than it is on its content of a specific unsaturated acid. The effects of linseed oil (rich in triethenoid $C_{18}$ acids) or fish oils (rich in tetraene, pentaene, and hexaene acids of $C_{20}$ and $C_{22}$ chain length) have not been tested under the experimental conditions described in the paper.

Some of the questions that require answers are listed. The authors conclude that recommendations for radical changes in food habits should await a clearer definition of the specific food factors that control serum-lipide levels. An understanding of the mechanisms involved may lead to practical measures for control of serum-lipide concentrations.

6.132 FISH MEAL PACKAGE PLANT

Carsten, H. A.
Canadian Fisherman 45, 20-21 (January 1958)

The economic utilization of fish waste in small centers or on shipboard, where utilities are frequently limited or entirely absent, is a long-standing problem. Attempts to use highly simplified fish-reduction plants employing conventional equipment did not strike at the root of the problem because such installations were still dependent upon external services. With considerable ingenuity, being used, reduction equipment has been fitted into large trawlers and, more successfully, into whale factory ships; but here the problem of providing the necessary power and heat has been even more difficult, owing to severe space restrictions.

Package plants. --For operations producing up to 2000 pounds of waste per hour, this problem has now been solved by an entirely self-contained package plant developed in England. The prototype illustrated here has undergone most extensive trials in Hull and Grimsby. Oily and nonoily fish and offal, shellfish, and other animal wastes were reduced to meal with satisfactory results. Four standard arrangements are available at present; these are distinguished by different capacities for different classes of raw materials. The flow-sheet shows a plant rated at 2000 pounds of oily or nonoily fish per hour.

Underlying the process is a combination of two features that, although well proven in other fields, are new to the fish processing industry. These are the Atritor built in Coventory, England, and the gas turbine.

The Atritor. -- The Atritor is a compact machine combining drying and grinding in a single

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 ABSTRACTER: Kathryn L. Osterhaug

6.82 CHITOSAN--USEFUL CHEMICAL FROM SHRIMP SHELLS

Meinhold, Ted F. and Thomas, Paul C.
Chemical Processing 21, 121-122 (April 1958)

Chitosan is an acid soluble, white, flaky, polymeric, acetamino carbohydrate derived from chitin that occurs in the shells of shrimp, crab, lobsters, beetles, locusts, and other animals. Chitosan is produced from purified chitin by hydrolysis.

Commercial operation. --A processing plant currently in operation at Brunswick, Georgia, is using 10,000 pounds of shrimp shells daily to produce about 500 pounds of dry chitosan.

The process. -- Shrimp shells are first cleaned to rid them of all protein and other extraneous matter by screening, washing, and boiling in a 1 to 5 percent solution of soda ash in a 5,000-gallon steel tank for about 5 hours. The boiled shrimp shells then are (1) washed to free them of soda ash, (2) transferred to a 5,000-gallon wooden tank, and (3) treated with a 1 to 5 percent solution of hydrochloric acid. The resultant product is essentially pure chitin, which has only limited use.

Chitin molecule. -- Chitin and cellulose differ only in that chitin has amine groups where cellulose has hydroxyl groups. Acetyl groups are attached to the amine groups of chitin.

Soluble chitin. -- To produce a chitin material that is soluble in dilute acid, some of the acetyl groups of chitin must be removed. This may be accomplished by treating chitin with 47 to 48 percent caustic at a near boiling temperature for 2 to 4 hours in a 5,000-gallon nickel-clad tank from which all air has been excluded. Rigid control is necessary during the boiling operation to avoid a breakdown of the cross-linkage of the molecule or the removal of the amine groups. After deacetylation,

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 ABSTRACTER: Martin Heerdt

6.190 NEW TYPE FISH MEAL SHOWS PROMISE IN MISSISSIPPI TESTS

Anonymous
Feedstuffs 30, 52 (March 29, 1958)

A new type of fish meal that is made from whole trash fish has shown favorable results as a source of protein, vitamins, and unidentified factors when used in experimental poultry rations. The new type of meal is made by grinding and steam dehydrating whole trash fish that until recently were being dumped back into the ocean by shrimp fishermen. Approximately 100 tons of this type of meal is being produced monthly at Vancleave, Mississippi. In tests conducted at Mississippi State College, the new fish meal was found to be equal to either menhaden meal or sardine meal when incorporated in broiler rations at a level to provide the same amount of protein as is provided by menhaden or sardine meal.

Growth and feed efficiency were approximately equal for the groups of broilers that received a ration containing either menhaden or sardine meal, or whole meal made from fish known as "croaker." Pigmentation, degree of finish, and feathering remained unchanged when whole meal was fed in place of menhaden or sardine meal.

Whole meal produced from croaker at the rate of 100 tons of meal per month represents less than $\frac{1}{4}$ of 1 percent of the amount of trash fish caught in shrimp nets along the Gulf Coast. Because trash fish are available throughout the year, they can be used to keep fish-meal plants in continuous operation and to provide a continuous supply of fresh fish meal. Menhaden fish meal, by comparison, is manufactured during only a short part of each year.

Composition. -- Whole croaker meal contained the following amounts of vitamins on a milligram

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 ABSTRACTER: Martin Heerdt

7.51 EVALUATION OF PROTEIN QUALITY. I. THE SIGNIFICANCE OF THE PROBLEM

Friedman, Leo (Food and Drug Administration, Department of Health, Education, and Welfare, Washington 25, D. C.)
Journal of the Association of Official Agricultural Chemists 41, 188-191 (February 15, 1958)

The problem of protein quality has been recognized and investigated for many years. Observed differences in nutritive quality of proteins are attributable to deficiencies of one or more amino acids. Information on amino acid composition is available for many proteins and foodstuffs. Correlations have been made between the amino acid composition and the nutritive value of proteins. These correlations cannot be used definitely to predict quality because of other factors; such as digestibility, presence of antitryptic substances, and processing conditions that result in new chemical linkages not susceptible to enzymatic digestion.

Another problem affecting the use of amino acid data to evaluate protein quality is that of amino acid imbalance. This area is not completely understood. A level of an amino acid, for instance, that is adequate by usual standards may be too low in the presence of an unusually high level of another amino acid.

Amino acid analyses yield significant information about the nutritive values of proteins and the interrelationships of amino acids in the diet. These analyses, however, cannot take the place of biological evaluation.

Most of the information on biological value of proteins concerns purified proteins or individual foodstuffs. In general, animal sources yield proteins of high quality; cereal grains yield proteins

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 ABSTRACTER: Neva L. Karrick

COMPACT MEAL PLANT

WHOLE TRASH-FISH MEAL

CHITOSAN FROM SHRIMP SHELLS

EVALUATION OF PROTEIN QUALITY

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per pound basis: riboflavin 4.9, niacin 32.8, pantothenic acid 6.6, choline chloride 1,730, and vitamin $B_{12}$ 0.059. Proximate analyses of whole croaker meal showed 62.5 percent protein, 11 percent fat, 6.5 percent calcium, 20.1 percent ash--of which 3 percent was phosphorus, 9 percent moisture, 1.88 percent methionine, 4.5 percent lysine, and 0.9 percent fiber. Pepsin digestibility as measured in the laboratory indicated that the whole croaker meal was 83 percent digestible.

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of low quality; and vegetables, oilseed meals, and nuts yield protein of intermediate quality. The poor quality of the protein in cereal foods is considerably improved when they are supplemented with protein from animal sources. These supplementary relationships have been applied in practical animal nutrition for many years. Soybean meal plus corn results in a better ration than corn alone. Further improvement is made by the addition of tankage, fish meal, or other protein concentrates.

The most efficient way to supply the protein requirements of man or of animals depends on a knowledge of the protein requirements. This approach is futile, however, because of the differences in protein quality among foods. Thus, it is necessary to shift from consideration of protein requirements to consideration of amino acid requirements.

In practical nutrition, the quality of the entire meal or food mixture is important. The total value may be greater than the sum of the individual parts. Quality may be improved by increasing the consumption of animal protein foods, by choosing plant sources on the basis of a desired pattern of available amino acids, or by adding synthetic amino acids to achieve the desired balance. Even though a plant protein has been improved so that it ranks with animal protein, it still may not have supplementary value for other unimproved plant sources and therefore cannot make the same contribution to the diet as animal protein.

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operation. Large-scale applications for the production of meal from whale, herring, and white fish already exist, and the first Canadian fish-meal plant based on the Atritor is being erected in Newfoundland. Drying is effected by means of hot air exhausted by the turbine. Because of the extremely short time of contact--approximately 3 seconds--the dried meal is relatively light in color and there is no evidence of charring. Ignition within the machine, such as is a common occurrence in orthodox flame dryers, was found to be impossible.

With the exception of shellfish, which are fed directly to the Atritor, the raw material is first cooked in its own liquor and subjected to a light pressing. So that the plant would be applicable to either oily or nonoily fish, the degree of pressing was selected in order to achieve a balance between maximum yield and maximum removal of oil.

Gas turbine.--The power and heat requirements of the entire plant including all ancillaries are met by an oil-fired gas turbine engine. The result is a self-contained processing unit requiring no electrical power, no boiler, and no furnace. In the selection of plant size, the main consideration is to ensure a reasonable balance between the power and heat requirements of the process, on the one hand, and the power and heat output from a suitable gas turbine, on the other.

It is the application of this idea to the concentration of the major part of the fish-meal process in a single compact machine that has made it possible to develop a package plant in the true sense of the term. The equipment is completely assembled, tested, and shipped on a single bedplate measuring 20 feet by 6 feet in the case of the 2000 pounds-per-hour plant. The weight of the assembly is approximately 14 tons. Obviously, foundation, building, and erection costs are quite low. In fact, there is no reason why the unit cannot be moved to a new location or even set up as a mobile installation. Operation is continuous and requires little attention other than that of bringing raw material to the plant and withdrawing bags of meal.

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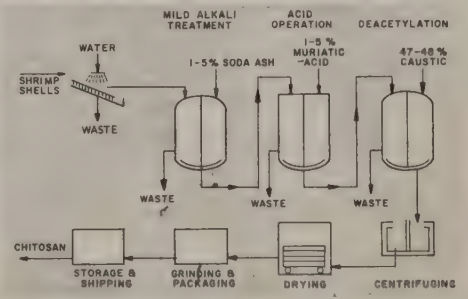
the chitin material is washed to remove all of the caustic, dried, and ground to a suitable particle size. The overall yield from the process is about 5 percent deacetylated chitin or chitosan, which has a moisture content of 6 to 8 percent.

Properties.--Chitosan is a high polymeric, free, primary amine that does not have a melting point and forms salts with certain acids. Chitosan is easily soluble in dilute, aqueous, organic acids such as acetic, glycollic, maleic, formic, adipic, and citric. Storage above 100° F. for an extended period of time causes chitosan to gradually develop cross linkages and to form a material that has a high viscosity. Extended exposure of dry chitosan to air will cause decomposition and yellowing, which result in a lowering of its viscosity in solution.

Starting with about 10,000 pounds of wet shrimp shells, process turns out approximately 500 pounds of dry chitosan per day.



7.51 EVALUATION OF PROTEIN QUALITY II. METHODS

Derse, Philip H. (Wisconsin Alumni Research Foundation, Madison)
Journal of the Association of Official Agricultural Chemists 41, 192-194 (February 15, 1958)

Methods currently being used to evaluate protein quality usually are based on rat growth. The criterion of response is "protein efficiency" and is defined as the weight gained per gram of protein consumed. Recent methods have used adult protein-depleted rats, with (1) depletion-repletion techniques, (2) tissue regeneration, (3) nitrogen balance, (4) amino acid decomposition, (5) bacterial protein digestibility, (6) reproduction studies, (7) enzymatic digests, and quality indices have been calculated from the data collected. Reference standards usually are whole egg, beef, or casein.

A collaborative study for the evaluation of 6 proteins was conducted by the Bureau of Biological Research at Rutgers from 1946 to 1950. Results were summarized by stating, "the protein efficiency measurement in the rat may be a reproducible technique in a given laboratory, but the results from one laboratory cannot be considered reproducible in another laboratory for proteins that are equal to or better than casein. It would appear that less difficulty is encountered with the proteins that are considerably poorer than casein. This may be due to the fact that the poorer sources chosen for the comparative study had a greater spread of values."

No standard method can be the complete answer to the problem of evaluating protein quality, but one can be chosen that definitely will assist public officials to interpret protein claims for foods. A method offered by the author will offer basic standards for discussion and still permit improvement of its limiting factors.

Experimental method. -- Ten weanling rats (21 days old) are placed in individual screen-bottom

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ABSTRACTER; Neva L. Karrick

7.611 ASSAY OF VITAMIN A OILS

Brunius E. (National Institute of Public Health, Tomteboda, Sweden)
Nature 181, 395-396 (February 8, 1958)

In 1954, a Vitamin Assay Commission was set up by the International Union of Pure and Applied Chemistry. One of the Commission's tasks was to develop a standardized method for the assay of vitamin A oils that would be acceptable in international trade.

Vitamin A oils vary widely in quality and potency. The Commission decided to consider them in two categories according to whether or not their spectrophotometric characteristics approached those of pure vitamin A. For oils in the first category (comprising most fish-liver oils and vitamin A concentrates), a correction procedure based on the Morton-Stubbs principle was considered sufficient. For oils in the second category (comprising whale-liver oils and other oils having a high proportion of irrelevantly light-absorbing materials), it was felt that a chromatographic step should precede the determination of extinction and the application of correction and that all measurements should be made on the unsaponifiable matter of the oils.

The Commission organized three collaborative experiments in which laboratories in Europe, Japan, and the United States cooperated. As a result of these experiments, the commission now makes the following recommendations for the assay of vitamin A oils:

1. All oils shall be saponified, and the assay made on the unsaponifiable matter.
2. The unsaponifiable matter shall be isolated by the method of the United States Pharmacopeia XV.
3. All spectrophotometric measurements shall be made in isopropanol as solvent.
4. Oils shall be considered in two categories: Category 1: those oils the unsaponifiable matter of which has an absorption maximum lying within the region 323-327 mμ and an extinction ratio $E_{300}/E_{325}$ not exceeding 0.73.

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ABSTRACTER: F. Bruce Sanford

7.599 CHEMICAL DETERMINATION OF PARALYTIC SHELLFISH POISON IN CLAMS

McFarren, E. F.; Schantz, E. J.; Campbell, J. E.; and Lewis, K. H. (U. S. Public Health Service, Cincinnati, Ohio)
Journal of the Association of Official Agricultural Chemists 41, 168-177 (February 1958)

The authors have developed a colorimetric test for the determination of shellfish poison in a trichloroacetic acid extract of clam meat. This test is based (1) on the selective adsorption and the elution of the poison on an XE-64 ion exchange resin and (2) upon the application of the Jaffee test to the eluate.

Test specificity. -- The specificity of the test depends upon the ability of the resin to concentrate the poison and to remove many substances that may interfere with the Jaffee test. Most of these many substances are removed by the resin treatment. A few of these substances, however, like histamine, may be adsorbed and eluted with the poison. Other of these many substances, such as ethanol, may combine with the poison and interfere with the test. The amount of these interfering substances or materials varies with the age or the state of decomposition of the shellfish. However, if the eluate is heated at 100° C. for 15 minutes to develop the Jaffee test, the absorbance of the interfering material at 510 millimicrons is about five times greater than that obtained at 38° C. for 20 minutes. In contrast, the absorbance of purified poison decreases to about one-third under identical conditions. From these observations, the authors have developed an equation for calculating the amount of poison present in a column eluate containing variable amounts of interfering material.

Findings. --At levels of 100 to 150 micrograms per 100 grams of clam meat or at higher levels, chemical assay has a precision of ± 45.6 micrograms and yields higher and more accurate value than

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ABSTRACTER: Martin Heerdt

7.80 FLAVOR: CAN IT BE MEASURED?

Gould, Wilbur A. (Ohio State University)
Food Packer 38, 10-11 (December 1957)

Several authorities in the flavor field presented papers at a symposium on Methodology of Sensory Testing at the 17th annual meeting of the Institute of Food Technologists.

National Canners method of flavor evaluation. --Of methods for laboratory evaluation of flavor, one used by laboratories working with the National Canners Association is particularly applicable to canned, frozen, and other processed foods.

A sample score sheet included in the text indicates that the method is based upon the comparison of samples with a reference. The degree of flavor difference is indicated by the judges who check one of eight gradations between no and extreme difference. The judges also indicate whether or not they consider the sample acceptable.

Advantages. --The method is easy to use; a minimum of time and of samples is needed; an accurate measure of the degree of flavor difference is provided between the samples; the data can be quickly and easily analyzed for statistical differences; and indications of flavor acceptance can be obtained.

Selection of panel members. --Persons chosen for the taste panel should be familar with the product, interested, and free of health indispositions. They should not eat or smoke for 30 minutes prior to a panel session. All potential members should be tested with actual samples, and those unable to detect flavor differences should be eliminated as panel members.

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ABSTRACTER: Richard W. Nelson

EVALUATION OF PROTEIN QUALITY

CHEMICAL ASSAY OF SHELLFISH POISON

VITAMIN A ASSAY

FLAVOR TESTING

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bioassay because of the adverse effects of salt upon bioassay. At lower levels of toxicity per 100 grams of clam meat, chemical assay is no better than bioassay because of the insensitivity of the tests with low levels of toxicity.

Conclusions. --The purified poison has been isolated from mussels and clams by similar methods; therefore, the colorimetric test probably is applicable to these shellfish and to other species of shellfish. Toxic samples of species of shellfish other than clams have not been studied.

Table 1. --Assay of poisonous clams

| | Mmg. poison per 100 g. clam meat | | | |
|---|---|---|---|---|
| | Bioassay on filtrate | Bioassay on eluate | Color test on eluate | Difference between color test and bioassay on eluate |
| Mya arenaria | 187 | 213 | 297 | 84 |
| Standard deviation | | ± 15.6 | ± 4.2 | ±14.9 |
| Percent deviation | | 7 | 2 | 18 |
| Saxidomus giganteus | 147 | 172 | 263 | 91 |
| Standard deviation | | ± 17.3 | ± 36.9 | ±26.4 |
| Percent deviation | | 10 | 14 | 28 |
| Saxidomus siphons | 298 | 367 | 453 | 86 |
| Standard deviation | | ± 84.0 | ± 56.0 | ±43.8 |
| Percent deviation | | 23 | 12 | 50 |
| Average amount of interference | | | | 87.3 |
| Standard deviation | | | | ±26.7 |
| Percent deviation | | | | 32 |

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cages. Weights of the animals extend over a range of 10 grams. The animals are divided into groups so that the average weight of each group is approximately the same. Water and test rations are supplied ad libitum. After 4 weeks, calculation is made of a "protein efficiency" ratio of average weight gain per average protein consumption. The animals are killed. The livers are removed and those from each group are pooled. Ether extracts and moisture analyses of the liver are determined. Vitamin-free casein is used as a control.

The criterion of liver fat is included as a standard test procedure to give another check point. The normal liver fat is usually 8 to 12 percent on a dry basis. This increases to 30 to 40 percent when poorer quality proteins are fed. The addition of amino acids often improves the protein efficiency but not the liver fat condition. The liver fat decreases as the test period continues, and at present there is little evidence to show any histopathological change other than fat infiltration of the liver cells.

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Judging environment. -- All flavor evaluations should be conducted in a quiet, clean, odor-free room at 72° F. This room should be equipped with individual booths.

Sample preparation and serving. -- The nature of the item to be tested will determine the amount of preparation needed before serving. The control or check sample will be used in three ways: as a reference, as a coded sample, and as a sample for preliminary screening of panel members.

Sample numbering should be done carefully so that no treatment will have the same designation in successive replicates, and the numerical order of treatments will be different.

After the test is completed, the supervisor assigns numerical scores of 1 to 9 to the flavor differences ratings checked by the judge.

7.611

Category 2: those oils the unsaponifiable matter of which has an absorption maximum lying outside the region 323-327 mμ or an extinction ratio $E_{300}/E_{325}$ exceeding 0.73.

5. For oils in category 1, the $E_{310}$, $E_{325}$, and $E_{334}$ values of the unsaponifiable matter shall be measured and a correction applied according to the formula:
$$E_{325}\ \text{corr.} = 6.815\,E_{325} - 2.555\,E_{310} - 4.260\,E_{334}$$
6. For oils in category 2, the unsaponifiable matter shall be chromatographed according to a prescribed procedure. Provided the chromatographed unsaponifiable matter satisfies the criteria for category 1 oils, its $E_{310}$, $E_{325}$, and $E_{334}$ values shall be measured and a correction applied as directed under 5.
7. Corrected $E_{325}$ value shall be used for calculating vitamin A potency, except in the cases mentioned under 8.
8. A corrected $E_{325}$ value which lies within ± 3.0 percent of the uncorrected value shall be regarded as equal to the uncorrected value for the purpose of evaluation, and the uncorrected value shall be used for calculating vitamin A potency. A corrected $E_{325}$ value which is greater than 1.030 times the uncorrected value shall be redetermined and, if confirmed, treated as a special case between buyer and seller.

The $E_{325}$ value is converted into $E^{1\%}_{1\,cm.}$ 325mμ. The vitamin A potency of the sample, expressed in I.U. per gm., is obtained by multiplying the $E^{1\%}_{1\,cm.}$ 325 mμ value by 1830.

7.81 ASSESSMENT OF QUALITY OF ICED WHITE FISH

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 5-6 (1957)

Sensory assessment.--Sensory methods of assessing quality of fresh fish are needed for use in marketing and processing whitefish. To supply this need, an existing panel system for scoring the quality of white fish on the basis of appearance, smell, and taste has been extended to include flat fish. A provisional score sheet used with the extended system is similar to one used for cod and allied species, and is based on the results of previous work with cod. Flat fish require new descriptive terms because the ones that are applicable to cod do not apply. Agreement on the selection of these terms is being sought.

Objective assessment.--Torry Research Station has recently published its findings on the extent of agreement that exists between panel sensory scores, values obtained from the chemical estimation of the total volatile base, and values obtained from the chemical estimation of the trimethylamine content of fresh and spoiling cod muscle. Methods are now under consideration to determine the practicability of applying these chemical indices of spoilage to the fishing industry.

The present procedure for measuring color by the tetrazolium color test for freshness calls for elution of the colored substances from the test paper after this paper has been in contact with the surface of the fish for a specific time. After the colored substance has been eluted, its color intensity is measured in a colorimeter. Variations in color occur at various places on the skin and on the gills of fish during spoilage. Even with these variations in color, the test appears to work as well with lemon sole and plaice as with cod and haddock. The tetrazolium color test also has been used on smoked white fish, and promising results have been obtained. Color reactions obtained with fillets

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ABSTRACTER: Martin Heerdt

8.8 HEALTH STANDARDS WILL UPGRADE FROZEN FOOD QUALITY

Anonymous
Frosted Food Field 26, 14 (March 1958)

The presence of an excessive number of bacteria in a frozen food does not necessarily indicate a health hazard, but it does almost invariably point to a product of poor quality.

Food products, whether shipped intrastate or interstate, may be seized for filth contamination. Result of such seizure is loss of money and consumer good-will, along with bad publicity for the packer. It is to the advantage of the food processor to follow closely recommendations of state food inspectors on sanitation and waste disposal.

Packers often overlook the effect of sanitation and plant housekeeping on personnel relations. An effective plant sanitation program is an incentive to the employee to be clean about his person in handling food. A dirty plant is a dangerous plant, good housekeeping goes hand in hand with safety, and efficient sanitation saves money and improves profits.

Careful inspection of the processing line with rejection of inferior or contaminated ingredients and products is essential. The objective of such inspection must be to insure that raw materials are free from extraneous materials, harmful bacteria, and toxic substances such as pesticides.

Since temperatures during transportation, storage, and distribution of frozen foods have thus far been left to the discretion of the handlers, both packer and consumer are at the mercy of the handler and distributor.

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ABSTRACTER: Kathryn L. Osterhaug

8.64 RIBOFLAVIN, NIACIN, AND THIAMINE IN APALACHICOLA BAY OYSTERS

Wentworth, Jane and Lewis, Harvye (The Florida State University, Tallahassee)
Food Research 23, 194-197 (March-April 1958)

Oysters are affected by the season of the year, the salinity of the water, and the temperature of the environment. This study of oysters was made (1) to follow seasonal variations that occur in the amounts of riboflavin, niacin, and thiamine and (2) to determine the relation between the amounts of certain vitamins of the B complex and other factors including dry matter and protein.

Oysters (Crassostrea virginica) obtained from Cat Point Reef in Apalachicola Bay were assayed for niacin, riboflavin, and total solids at monthly intervals beginning in February 1955 and ending in August 1956. Thiamine was also determined beginning in October 1955 and ending in August 1956. A portion of the samples was analyzed for nitrogen, and the percent protein in these samples was calculated by multiplying the percent nitrogen by the factor 6.25.

No obvious changes were observed in the levels of niacin, riboflavin, or thiamine during the summer months when oysters are considered to be of poor quality. Niacin values were slightly higher during the summer season. Average values for the entire period of study as expressed in milligrams per 100 grams of fresh oysters were niacin 1.97, riboflavin 0.18, and thiamine 0.12. Large differences were observed in the amounts of total solids and protein, but these constituents could not be related to the results obtained from the vitamin assays. Thiamine values in oyster homogenates decreased rapidly during frozen storage. Smaller losses in thiamine occurred when the oyster meats were frozen whole or when the meats had been heated before they were frozen.

See tables, over.

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ABSTRACTER: Martin Heerdt

9.19 DEADLY MIX

Anonymous
Chemical and Engineering News 36, 70 (April 21, 1958)

Chemical wastes combined with sea water are not necessarily toxic to marine life. Toxicity may arise, however, if the pH of the mixture of sea water and chemical waste is lowered. At pH 5.5, the mixture may even become deadly to fish.

Types of wastes.--Chemical wastes that become toxic in salt water with a change in pH may originate from the manufacture of superphosphate and other chemicals. Metallic ions and acidic components of the waste are particularly hazardous to the fish. If wastes of these types are discharged into sea water at a concentration of about 0.5 percent so that the mixture of waste and sea water is at pH 5.5 or less, toxic conditions will arise. With a further decrease in pH, even greater toxicity may occur.

The synergistic or additive effect of chemical waste was discovered when a large quantity of fish was killed in San Francisco Bay during 1957. Samples of bay water drawn after the kill had occurred showed substances such as sulfuric acid, hydrofluoric acid, sulfur dioxide, copper, zinc, iron, lead, and arsenic. The toxicity of these substances in salt water was unknown prior to 1957.

Experimental findings.--The conditions that existed in San Francisco Bay were reproduced on an aquarium scale to determine the degree of toxicity of various impurities in salt water. All of the waste studied under these conditions showed extreme variability in toxicity. Copper, zinc, aluminum, manganese, and cadmium, alone or in combination, were nontoxic over a wide range of concentration. The amounts of lead and tin present in highly toxic samples appeared to be too small to add to the overall toxicity. Wastes that were capable of causing a considerable decrease in the

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ABSTRACTER: Martin Heerdt

TETRAZOLIUM TEST FOR FRESHNESS

B VITAMINS IN OYSTERS

QUALITY CONTROL OF FROZEN FOOD

CHEMICAL WASTE POLLUTION

8.64

TABLE 1

Vitamin content, and per cent total solids in raw oysters

| Month | Per cent solids | Niacin | | Riboflavin | | Thiamine | |
|---|---|---|---|---|---|---|---|
| | | Wet | Dry | Wet | Dry | Wet | Dry |
| | | Mg./100 g. | Mg./100 g. | Mg./100 g. | Mg./100 g. | Mg./100 g. | Mg./100 g. |
| 1955 | | | | | | | |
| February | 17.5 | 1.59 | 9.4 | 0.20 | 1.12 | | |
| April | 18.7 | 2.05 | 10.8 | 0.20 | 1.09 | | |
| May | 15.7 | 1.68 | 10.6 | 0.09 | 0.57 | | |
| June | 11.5 | 1.51 | 13.3 | 0.08 | 0.73 | | |
| July | 16.2 | 2.52 | 15.6 | 0.12 | 0.74 | | |
| August | 13.4 | 1.99 | 14.9 | 0.12 | 0.89 | | |
| September | 15.4 | 2.45 | 15.9 | 0.06 | 0.41 | | |
| October | 21.8 | 3.34 | 15.4 | 0.27 | 1.22 | 0.08 | 0.36 |
| November | 13.2 | 1.41 | 10.6 | 0.24 | 1.83 | 0.08 | 0.61 |
| December | 13.9 | 1.54 | 11.1 | 0.26 | 1.87 | 0.12 | 0.85 |
| 1956 | | | | | | | |
| January | 15.1 | 1.47 | 9.7 | 0.12 | 0.75 | ..... | ..... |
| February | 11.7 | 1.41 | 11.9 | 0.10 | 0.83 | 0.10 | 0.82 |
| March | 16.0 | 2.07 | 13.1 | 0.21 | 1.28 | 0.16 | 0.94 |
| April | 16.0 | 2.14 | 13.6 | 0.27 | 1.64 | 0.18 | 1.00 |
| May | 15.1 | 2.12 | 14.1 | 0.23 | 1.51 | 0.12 | 0.81 |
| June | 14.1 | 1.95 | 13.9 | 0.23 | 1.66 | 0.12 | 0.86 |
| July | 15.9 | 2.13 | 13.3 | 0.28 | 1.77 | 0.13 | 0.79 |
| August | 13.3 | 2.05 | 14.7 | 0.20 | 1.49 | 0.10 | 0.72 |
| Average | 15.2 | 1.97 | 12.9 | 0.18 | 1.19 | 0.12 | 0.78 |

TABLE 3

Protein content and vitamins per g. nitrogen in oysters

| Date | Per cent protein, N x 6.25 | | Niacin mg./g. nitrogen | Riboflavin mg./g. nitrogen | Thiamine mg./g. nitrogen |
|---|---|---|---|---|---|
| | Fresh | Dry | | | |
| 1955 | | | | | |
| February | 72 | 42 | 1.54 | 0.18 | ..... |
| April | 86 | 53 | 1.39 | 0.09 | ..... |
| May | 81 | 51 | 1.30 | 0.07 | ..... |
| June | 58 | 51 | 1.64 | 0.09 | ..... |
| July | 90 | 53 | 1.87 | 0.09 | ..... |
| August | 78 | 56 | 1.67 | 0.10 | ..... |
| September | 89 | 57 | 1.74 | 0.16 | 0.04 |
| October | 89 | 50 | 1.32 | 0.23 | 0.08 |
| November | 58 | 52 | 1.33 | 0.23 | 0.10 |
| December | 73 | | | | |
| 1956 | | | | | |
| January | 77 | 47 | 1.25 | 0.08 | 0.08 |
| February | 51 | 42 | 1.84 | 0.13 | 0.13 |
| March | 78 | 46 | 1.79 | 0.07 | |
| April | 98 | 48 | 1.83 | 0.22 | |
| May | 74 | 47 | 1.88 | 0.20 | |
| Average | 76 | 50 | 1.49 | 0.13 | 0.10 |

9.19

pH of the sea water were the most toxic. At pH 4.85, one sample that contained 5,600 p.p.m. of waste in salt water killed all fish placed in it in a period of four hours. When this same aquarium mixture was buffered to a pH 7.5, all of the fish were able to survive. Some unidentifiable toxic effect, however, may have been responsible for the death of the fish in the aquarium sample.

In a second series of bioassays, suspect chemicals were mixed individually with sea water at concentrations similar to those present in the toxic aquarium samples and at the critical pH of 5.5. After some initial distress, all fish survived these aquarium tests.

Conclusions.--The studies indicated that a pH of 5.5 alone or in combination with individual reagents as well as a decrease in the oxygen content was not responsible for the large kill of fish in San Francisco Bay. It appears, therefore, that an unknown combination effect or an unknown synergistic effect was in operation in San Francisco Bay when the kill occurred. The exact cause of the kill was not established by this study.

7.81

are not of the same intensity within a given time as the color reactions obtained from the surface of whole fish. A need exists, therefore, to determine specific color standards for assessing spoilage in fillets.

If a large number of fish samples are to be evaluated by the color test, the procedure obviously is too complicated. Attempts have been made to overcome the complications of elution by reading the color intensity directly from the test paper. This has been made possible in one instance by using papers that contain the tetrazolium salt in a graded series of concentrations along the length of each paper strip. With this paper, the degree of freshness is indicated by the number of concentration bands affected in a given interval of time. A second method for using the papers directly makes use of a series of uniformly impregnated papers that contain much lower concentrations of tetrazolium salts than have been used previously. Both methods have shown promise, particularly when used with fish at or near the condemnation level of spoilage.

8.8

Frozen foods differ from those preserved by other methods since they are not pasteurized or sterilized. As a result, bacteria are present, and frozen foods must depend upon maintenance of low temperature to prevent multiplication of microbes. Although frozen foods have produced no recorded cases of botulism, there is no guarantee that an outbreak could not occur, unless frozen food packers continue to be vigilant in controlling their products.

Surveys are being concentrated initially on precooked foods since these are most susceptible to bacteriological contamination. Results of preliminary surveys have indicated that many of the bacteriological test procedures being used by frozen food packers may be out of date. The International Association of Milk and Food Sanitarians has expressed the opinion that the frozen food industry is fortunate indeed that its safety record is as good as it is.

All packers are advised to make bacterial counts regularly, using a consulting laboratory for this purpose if they do not have one of their own.

0.33 BIOCHEMISTRY

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 23-25 (1957)

(Abstract of this article appears under 0.35 page 1 - June 1958)

0.33 COAGULATION TEMPERATURES OF SOME HEMOGLOBIN COMPOUNDS

Havemann, Robert and Mahling, Andreas (Humboldt Univ., Berlin)
Z. physik. Chem. (Leipzig) 207, 86-90 (1957)
Chemical Abstracts 51, 18026 (November 25, 1957)

The coagulation temps. of some hemoglobin compds. viz. methemoglobin cyanide, CO hemoglobin, and methemoglobin have been detd. nephelometrically.

0.33 COMBINATION OF FISH ACTOMYOSIN WITH ANIONIC AND CATIONIC DYES

Migita, Masao and Otake, Shigeo (Tokai-ku Regional Fisheries Expt. Sta., Tokyo)
Nippon Suisangaku Kaishi 22, 260-4 (1956-57)
Chemical Abstracts 52, 5675 (April 10, 1958)

0.5 CHANGES IN THE SKIN FLORA OF COD AFTER WASHING AND ICING

Georgala, D. L.
J. appl. Bact. 20, 23-29 (1957)
Food Science Abstracts 29, 527 (December 1957)

Cod fish that were gutted and washed for about 15 seconds with running sea water had lower numbers of bacteria on the skin than ungutted, unwashed controls. The percentage representation of the various genera was not materially affected. After the gutted, washed fish had been in contact with ice from a trawler's ice bunker, counts increased to the original values or higher, and the proportions of different bacteria present were often markedly changed. Ice obtained direct from the factory did not have this effect.

0.5 THE KINETICS OF BACTERIAL INACTIVATION BY HEAT

Charm, S. E. (Department of Food Technology, Massachusetts Institute of Technology, Cambridge)
Food Technology 12, 4-8 (January 1958)

The author has used a kinetic approach to derive an equation describing the logarithmic survival curve. The logarithmic survival curve may be due to the kinetics of inactivation.

2.02 STUDIES ON BEEF QUALITY. I.--III.

Howard, A. and Lawrie, R. A.
Dep. sci. industr. Res., Lond., Food investig. spec. Rep. No. 63, 79 pp. (1956)
Commonw. sci. industr. Res. Orgn. Aust., Div. Food Pres. Transp. tech. Pap. No. 2, 72 pp. (1956)
Food Science Abstracts 29, 202 (June 1957)

In three papers, the author presents details of cooperative investigations primarily aimed at improving the quality of frozen beef exported from Australia. Titles are as follows: (1) the effect of blast-freezing hot beef quarters, (2) physiological and biological effects of various preslaughter treatments, and (3) the influence of various preslaughter treatments on weight losses and eating quality of beef carcasses.

2.02 POST-MORTEM CHANGES IN ACID-SOLUBLE NUCLEOTIDES OF RESTED CODLING (GADUS CALLARIAS) MUSCLE AT 0°

Murray, J. and Jones, N. R. (Torry Research Station, Aberdeen, Scotland)
The Biochemical Journal 68, 9p (January 1958)

Separations similar to those from exhausted codling were obtained with a Dowex-1 formate-elution system with the exception of an unidentified peak following AMP.

2.02 SLOW FREEZING OF CARP MUSCLE AND INOSINIC ACID FORMATION

Saito, Tsuneyuki and Arai, Kenichi (University of Hokkaido, Hakodate, Japan)
Archives of Biochemistry and Biophysics 73, 315-319 (February 1958)

This report presents in detail, evidence for the identification of inosine monophosphate.

3.12 PROCESSING OF SHELLFISH AND CRUSTACEANS

Fellers, Carl R. (Amherst, Massachusetts)
U. S. Patent 2,669,520 (February 16, 1954)

This invention relates to improvements in the treatment of seafood, shellfish, and crustaceans and includes an improved method of preserving the natural color, flavor, and appearance of such seafood, as well as the resulting seafood products.

3.12 ANTIBIOTIC TREATMENT OF CRAB AND OYSTER MEATS

Benarde, Melvin A. and Littleford, Robert A. (Univ. of Maryland, Crisfield)
Appl. Microbiol. 5, 368-72 (1957)
Chemical Abstracts 52, 4881 (March 25, 1958)

Chlortetracycline and oxytetracycline added to crab meat and oyster meats decreased the bacterial counts, but did not extend the storage life beyond that of untreated samples.

3.2341 CORRELATION BETWEEN THE TEMPERATURE, THE VELOCITY OF AIR FLOW APPLIED IN FREEZERS, THE FREEZING TIME OF GOODS AND THE CONDITIONS OF OPTIMAL OPERATION

Almasi, E.
Proc. 9th Int. Congr. Refrig., Paris, pp. 4171-4178 (1955)
Food Science Abstracts 29, 404 (October 1957)

The approximate time required for freezing pork sides or beef quarters can be calculated by using Plank's formula for block-shaped bodies. The actual freezing time for trimmed pork sides frozen in a tunnel was 4.4 hours, compared with 4.63 hours. Freezing time in a sharp-freezer was 22.5 hours, compared with a calculated time of 21.6 hours. The heat of freezing is almost independent of the temperature and speed of air flow and the time of freezing.

3.2341 FACTORS AFFECTING FREEZING RATE AND APPEARANCE OF EVISCERATED POULTRY FROZEN IN AIR

Van den Berg, L. and Lentz, C. P. (National Research Council, Ottawa, Canada)
Food Technology 12, 183-185 (April 1958)

The lightness and uniformity of appearance of eviscerated, vacuum-packaged poultry frozen in an air blast depended upon the rate of freezing and increased markedly when the air velocity (at -20° F.) was increased from 0 to 700 feet per minute, or when the temperature (at an air velocity of 500 f.p.m.) was lowered from +10° F. to -20° F.

3.2381 CALCIUM ALGINATE FILMS AND THEIR APPLICATION FOR MEATS USED FOR FREEZING

Berlin, A.
Myasnaya Ind. S.S.S.R. 28, No. 2, 44-7 (1957)
Chemical Abstracts 51, 17007 (November 10, 1957)

Ca alginate films are used for coating meats to be frozen.

3.2381 THE BASIS OF FISH GLAZING

Piskarev, A. and Gakichko, S.
Kholod. Tekh. 31, No. 4, 36-39 (1954)
Food Science Abstracts 29, 523 (December 1957)

The formation of an ice glaze depends upon: (1) the initial temperature of the fish; (2) the duration and number of immersions; (3) the temperature of the water; and (4) the weight and shape of the fish. Restoration of the temperature of the superficial layer of the fish to the original level in the frozen fish takes several hours. A large part of the ice glaze is formed by loss of heat to the surrounding air. The quality of the fish is not affected by glazing.

3.2492 COEFFICIENTS OF EVAPORATION FROM ICE AND FROZEN MEAT IN REFRIGERATED WAREHOUSES

Ryutov, D.
Kholod. Tekh. 31, No. 2, 45-51 (1954) (U.S.S.R.)
Food Science Abstracts 29, 503 (December 1957)

Loss of weight by frozen products obeys the laws of surface evaporation. At low relative humidities, the moisture content of the surface layer decreases at 14° F. and at a relative humidity of 90%, it reaches 24.8%. Equations were derived for calculating (1) the weight of moisture evaporating in 1 hour, (2) the amount of heat transferred per hour from the air to the meat, (3) the pressure-temperature relation between -5° and -22° C., (4) the weight of moisture evaporated, and (5) for the coefficient of evaporation, in terms of a "psychrometric factor."

3.2492 LAWS OF DRYING OF FROZEN MEAT DURING STORAGE

Ryutov, D. G.
Leningrad, tekhnol. Inst. Kholod. Prom., Trud. 10, 10-21 (1956)
Food Science Abstracts 29, 503 (December 1957)

Frozen meat has a partially dried surface layer with a large internal surface, which promotes oxidation and adsorption of odors. Equations are derived for calculating the rate of drying, i.e. the exchange of heat and moisture between the product and surfaces in the cold store, with particular reference to heat transmission by radiation.

3.2497 THE TIME TEMPERATURE TOLERANCE OF FROZEN FOODS. V. TEXTURE STABILITY OF THICKENED PRECOOKED FROZEN FOODS AS INFLUENCED BY COMPOSITION AND STORAGE CONDITIONS

Hanson, H. L.; Fletcher, L. R.; and Campbell, A. A. (U. S. Department of Agriculture, Albany 10, California)
Food Technology 11, 338-343 (June 1957)

A fluctuating storage temperature ranging from -10° to 10° F. was found to be considerably more damaging to the texture of a white sauce containing thickening agents such as waxy rice flour, egg yolk, and whole egg than a constant temperature of 0° F. Methods for improving texture stability of the sauce under adverse conditions included (1) the use of additives such as pectin, gelatin, gums, and carrageenin and (2) formula changes to reduce the amount of egg and liquid and increase the amount of flour.

3.2497 THE STORAGE OF FROZEN MEAT AT A TEMPERATURE OF -18° C.

Markin, G.
Kholod. Tekh. 31, No. 1, 33-38 (1954) (U.S.S.R.)
Food Science Abstracts 29, 504 (December 1957)

Different grades of beef (sides and quarters), mutton (carcasses), and pork (sides) were frozen, and stored at 18° and -12° C. After storage for 1 year, the losses in weight from a normally fattened animal were 15.9 to 28.2% at -18° C. and 11.4 to 20.5% at -12° C. After storage at -18° C. and a relative humidity of 93.7% for 2 years: (1) the quantity of drip on thawing was 4.5% for beef, 5.0% for mutton, and 2.8% for pork; (2) the peroxide value of the outer fat was 0.20 to 0.25 in beef and mutton and 0.60 to 0.75 in pork; and (3) the acid value of the outer fat was 1.60 to 1.70 in beef, and 1.10 to 1.20 in mutton and pork.

3.332 ANCHOVY PASTE

Anonymous
Food Manufacture 32, 405 (August 1957)

| | | | |
|---|---|---|---|
| Anchovies | 112 pound | Curry powder | 1 ounce |
| Butter | 18 pound | Ground nutmeg | ½ ounce |
| Salt | 2 pound | Color to suit | |
| White pepper | 4 ounce | | |

Split, bone and mix the fish with the other ingredients. Pass the mixture through a fine mincing machine and a fine sieve, then fill into containers and process for about 45 minutes.

3.332 RATIONAL UTILIZATION OF VEGETABLE OIL IN CANNING (OF FISH)

Vershinin, A. A.
Rybnoe Khoz. 33, No. 4, 84-8 (1957)
Chemical Abstracts 51, 13257 (September 10, 1957)

4.21 PERIODATE-PERMANGANATE OXIDATIONS. V. OXIDATION OF LIPIDES IN MEDIA CONTAINING ORGANIC SOLVENTS

Rudloff, E. v. (Natl. Research Council Can., Saskatoon, Saskatchewan)
Can. J. Chem. 34, 1413-18 (1956)
Chemical Abstracts 51, 3161 (February 25, 1957)

The method previously reported has been extended by the use of media contg. tert-BuOH or pyridine to allow detn. of unsatd. lipides. Data are given for the extent of oxidation of methyl oleate and triolein after treatment for various times in media contg. 10 to 50% pyridine or 20 to 70% tert-BuOH.

4.21 THE APPLICATION OF INFRARED SPECTROSCOPY TO A STUDY OF SOME REACTION INTERMEDIATE AND PRODUCTS OF THE AUTOOXIDATION OF LONG-CHAIN OLEFINS

Gold, J.
Journal of the Chemical Society, pp. 934-942 (March 1958)

The action of gaseous oxygen on methyl oleate and elaidate, long-chain $\alpha$-diols, epoxides, $\alpha$-ketols, and $\alpha$-diketones has been examined.

4.21 DISCOLORATION OF FISH OIL. XI.

Nonaka, Junsaku (Tokyo Coll. Fisheries)
Nippon Suisangaku Kaishi 21, 1244-71 (1955-56)
Chemical Abstracts 52, 4214 (March 10, 1958)

4.91 FATS IN NUTRITION AND HEALTH

King, C. G. (The Nutrition Foundation Inc., New York, New York)
Journal of the American Oil Chemists' Society 34, 559-563 (November 1957)

Glyceride types of fats and oils are regarded as essential ingredients in human diets. Experimental animals do require natural fats that contain certain unsaturated fatty acids, namely linoleic and arachidonic acids; however, the human need for these fatty acids is unknown. Good-quality protein foods, such as meat, milk, poultry, eggs, and fish, should be used regularly and in variety.

4.91 NUTRITIONAL QUALITY OF FRYING FATS IN COMMERCIAL USE

Melnick, Daniel (Research Laboratories, Best Foods Inc., Bayonne, New Jersey)
Journal of the American Oil Chemists' Society 34, 578-582 (November 1957)

Neither thermal polymers nor thermal oxidative polymers are present in the oils employed in commercial frying operations. Trans fatty acids do not develop during the heating operations. Changes in the triglyceride content and the linoleic acid content of the frying oils are too small to be nutritionally significant.

4.91 A SERIES OF NEW COMPOUNDS INHIBITING COENZYME A AND CHOLESTEROL AND LIPIDE-INCREASING FACTORS

Garattini, S.; Morpurgo, C.; Murelli, B.; Paoletti, R.; and Passerini, N. (Univ. Milan)
Arch. intern. pharmacodynamie 109, 400-14 (1957)
Chemical Abstracts 51, 16590 (November 10, 1957)

6.130 TREATING HERRING OR OTHER CRUDE ANIMAL MATERIAL TO OBTAIN MEAL AND OIL

Notevarp, O.
Norw. 88,480 (Dec. 10, 1956)
Chemical Abstracts 51, 18390 (November 25, 1957)

Before or during the treatment of the crude material, $Ca(H_2PO_4)_2$ is added so that pH after boiling is decreased to 6.3 to 6.5. In spite of the small aqueous solubility of $Ca(H_2PO_4)_2$, it gives good results as a buffering agent. It also acts more favorably on the coagulation than do acid salts of dibasic acids.

6.130 FAT-FREE ANIMAL FEED PRODUCTS

Stobe, Robert (to Wacker-Chemie G. m. b. H.)
U.S. Patent 2,788,275 (Apr. 9, 1957)
Chemical Abstracts 51, 18389 (November 25, 1957)

A dry powd., essentially odorless, substantially fat-free product, suitable for use as an animal feed can be prepd. The batch of fatty fish or animal carcasses is heated with steam in a reaction vessel under pressure to about 119°. Liquid perchlorethylene (I) is added and heating is continued, whereby the perchloroethylene-water azeotrope distils over, dehydrating the material. The residual liquid I simultaneously dissolves the fatty material and is removed, leaving a residual extd. solid material. This is then infused with vapors of I until the vapor temp. reaches 119°. Steam at 115° is then applied under pressure to remove I and leave the final product.

## LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner and Freezer
Chemical Abstracts
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Feedstuffs
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Food Packer
Food Preservation Quarterly
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Industrial Refrigeration
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Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
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Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
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Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

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Editorial Clerk (Typist)--Gladys K. Chandler

6.133 FISH MEAL 19. SOLVENT RECOVERY

Van der Merwe, R. P. and Nachenius, R. J.
Annual Report, Fishing Industry Research Institute, Cape Town, South Africa 9, 33 (1955-1956)

Solvents used in the manufacture of fish flour must be recovered and purified for reuse. Certain odoriferous contaminants in the solvent cannot be isolated by ordinary distillation. During 1954 to 1955 both the vapor and the liquid phase of the solvent were deodorized by fractional distillation, treated with chlorine, and treated with activated charcoal. In 1955 to 1956, treatment of the vapor phase of the solvent with 6 percent granulated carbon of a certain grade gave a satisfactory solvent purification. Spent carbon was reactivated with live steam.

6.133 (Cross Reference: 6.15)

TREATMENT OF THE LIQUID OBTAINED FROM HERRING-OIL AND HERRING-MEAL FACTORIES

Limvann, Aktieselskabet
Norw. 89, 580 (July 22, 1957)
Chemical Abstracts 51, 18389 (November 25, 1957)

The herring are boiled at atm. pressure and the pulp is pressed off. The obtained liquid is sepd. from the oil after it has been concd. by evapn. to 40% solids and before the necessary and complete evapn. or drying to prep. fodder. During this evapn. the differences in sp. gr. between the liquid and the oil dispersed therein increase. This facilitates the sepn. of the oil during subsequent centrifugation.

6.137 PURIFICATION OF GLYCERIDE OILS BY MEANS OF ION-EXCHANGE RESINS

Chasanov, Martin G.; Kunin, Robert; Mattikow, Morris; and Thurman, Benjamin H. (One-half to Clayton, Benjamin, trading as Refining, Unincorporated, and one-half to Rohm & Haas Co.)
U. S. Patent 2,771,480 (November 20, 1956)
Chemical Abstracts 51, 3163 (February 25, 1957)

Fatty acids, color bodies, gums, and flavoring materials are removed from glyceride oils by adsorption on basic anion-exchange resins contg. quaternary ammonium hydroxide groups (C. A. 46, 7364e; 47, 2401c). With viscous oils, the operation is carried out at 140° to 80° F. or with the oil dissolved in approx. an equal vol. of an org. solvent, e.g. hexane or petr. ether.

6.137 CONTINUOUS PRESSURE FILTRATION PILOT PLANT APPLICATIONS TO VEGETABLE OILS

Bergstedt, Dale C.; Dahlstrom, Donald A.; and Harms, van D.
Industrial and Engineering Chemistry 49, 1863-1870 (November 1957)

Progressive firms are making a detailed study of their batch operations to determine if the many advantages of continuous processing apply in their specific situations. Filtration of vegetable oils is an example of this.

6.237 VITAMIN A FROM FISH LIVER OIL

Abe, Yoshiro and Ihara, Toyoko (to Nippon Vitamin-Oil Industries Co., Ltd.)
Japan 2797 (April 25, 1955)
Chemical Abstracts 51, 13323 (September 10, 1957)

Fish liver oil is treated with lower alcs. with caustic alkali as a catalyst. Urea is added to remove impurities in the form of their urea complexes. The filtrate is evapd. or extd. with petr. ether to give a concd. soln. of vitamin A.

6.237 REFINING OF FISH OILS AND FISH-LIVER OILS

Yoneda, Naoki (Hayashikane Marine Industries Co.)
Japan 1836 (Mar. 20, 1957)
Chemical Abstracts 52, 4217 (March 10, 1958)

6.237 VITAMIN A CONCENTRATE FROM MARINE-ANIMAL OILS

Higashi, Hideo; Shimma, Yaichiro; Imaki, Toyosuke; and Yamakawa, Tateshige
Japan 4730 (July 9, 1957)
Chemical Abstracts 52, 5758 (April 10, 1958)

Marine-animal oil (100 g.) containing 370,000 units per gram of vitamin A in 150 ml. of 70% methyl alcohol is saponified with 19 grams sodium hydroxide in 20 ml. of water.

6.249 INFLUENCE OF THE LIVER ENZYME ON THE DECREASE OF VITAMIN A IN THE FISH LIVER DURING STORAGE

Shimizu, Chiaki and Fukuhara, Tadanobu
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 2, 115-119 (1957) (English synopsis and figures)

The causes of the decrease of vitamin A in mackerel liver during storage are considered to be the actions of enzymes and hemin contained in the liver. The mechanism of vitamin A oxidation by this enzyme and hemin is considered to be as follows: the portion of $-CH{=}CH-CH_2-CH{=}CH-$ in linoleic acid or linolenic acid is oxidized to hydroperoxide, then it oxidizes vitamin A secondarily, similarly to the vegetable lipoxidase.

6.249 PROLONGED STORAGE OF FROZEN COD LIVERS AT LOW TEMPERATURES

Kaminarskaya, A.
Kholodil'naya Tekh. 34, No. 2, 45-8 (1957)
Chemical Abstracts 51, 15829 (October 25, 1957)

Frozen cod livers were stored in a wrapper of wax paper, and by aid of analyses for vitamins A, D, and provitamin D it was found that these livers remained unchanged in their medical action, depending on the storage temps.: 2 weeks (-18°), 3 weeks (-25°), 1.5 months (-35°), and 3.5 months (-46°). These values have no absolute significance. The amt. of cod-liver oil after defrosting will be 30 to 40% higher than that produced from fresh livers.

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| Cook and serve fillet package | 7 | 3.2383 |
| Calcium alginate films for freezing | 19 | 3.2381 |
| Method of glazing | 19 | 3.2381 |
| **Frozen fish, processing** | | |
| Infrared cooking of fish sticks | 7 | 3.237 |
| Air blast freezing conditions | 19 | 3.2341 |
| Freezing poultry in air | 19 | 3.2341 |
| **Gear, fishing** | | |
| Fishing gear design | 1 | 2.1121 |
| Echo-ranging for fish | 1 | 2.116 |
| Echo traces for trawling | 3 | 2.116 |
| **Handling fresh fish** | | |
| Holding fish in brine | 3 | 2.15 |
| **Oils, chemical and physical properties** | | |
| Oil discoloration | 21 | 4.21 |
| Autooxidation of long-chain olefins | 21 | 4.21 |
| Periodate-permanganate oxidations | 21 | 4.21 |
| **Oils, nutrition** | | |
| Cod-liver oil for hens | 9 | 4.90 |
| Effect of oils on serum lipides | 9 | 4.91 |
| Essential fatty acids | 9 | 4.91 |
| Coenzyme A inhibitor | 21 | 4.91 |
| Nutritional quality of frying oils | 21 | 4.91 |
| Fats in nutrition and health | 21 | 4.91 |
| **Preserved fish, miscellaneous** | | |
| Irradiation of fish | 7 | 3.19 |
| **Preservatives and sanitation** | | |
| Preservative for fish livers | 5 | 3.14 |
| Preservative ices for fish | 5 | 3.17 |
| Water purification | 5 | 3.18 |
| Color preservation of shellfish | 17 | 3.12 |
| Antibiotic for crab and oyster meats | 17 | 3.12 |
| **Spoilage** | | |
| Fillet spoilage studies | 1 | 2.00 |
| Handling fresh fish | 1 | 2.00 |
| Kinetics of bacterial inactivation | 17 | 0.5 |
| Effect of washing on flora | 17 | 0.5 |
| Inosinic acid in carp muscle | 17 | 2.02 |
| Changes in nucleotides of cod | 17 | 2.02 |

7.53 DETERMINATION OF THE LIPIDE CONTENT OF FISH MEALS

Montequi, Dominica and Pineda, Ma. D. Garcia
Bol. inst. espan. oceanog. No. 78/9, 13 pp. (1956)
Chemical Abstracts 51, 12374 (August 25, 1957)

Fish meal is a very heterogeneous substance and therefore the sample taken for analysis should be large. Complete extn. of the lipides presents many difficulties. When the meal is extd. with acetone plus 1% HCl the values are higher than when just acetone is used, since the HCl releases nonlipide materials which give fictious values. The N and P contents of the fats extd. by $Et_2O$ are lower than those of fats extd. with acetone, which probably exts. more nonlipide material. The amt. of lipide extractable decreases as the sample ages.

7.53 DETERMINATION OF FAT IN WHALE-MEAT EXTRACT

Benterud, A. (Collett & Co. A/S, Oslo, Norway)
Norsk Hvalfangst-Tidende 45, 511-12 (1956)
Chemical Abstracts 51, 18655 (November 25, 1957)

7.611 APPLICATION OF CONVERSION FACTORS FOR THE DETERMINATION OF VITAMIN A IN FISH-LIVER OILS

Balasundaram, S.; Cama, H. R.; Sundaresan, P. R.; and Varma, T. N. R. (Indian Inst. Sci., Bangalore)
J. Sci. Ind. Research (India) 16C, 8-11 (1957)
Chemical Abstracts 51, 10841 (July 25, 1957)

In the spectrophotometric detn. of vitamin A potency of fish-liver oils, a conversion factor for International Units was sought which would be unaltered by oxidation of the oil during storage. The value of $E^{1\%}_{1cm.}$ at 290 mμ x 3000 (cyclohexane) is not altered by oxidation and can therefore be used in the detn. of the original vitamin A potency.

7.611 DETERMINATION OF VITAMIN A BY CONVERSION TO ANHYDROVITAMIN A

Budowski, P. and Bondi, A. (Agricultural Research Station, Rehovot, Israel)
The Analyst 82, 751-760 (November 1957)

Vitamin A may be converted to anhydrovitamin A in benzene solution at room temperature, in the presence of toluene-p-sulphonic acid as a catalyst. The increase in extinction at 399 mμ, which results from the dehydration, is proportional to the amount of vitamin A present and can be used for the determination of this vitamin in unsaponifiable extracts of vitamin A concentrates, fish oils, margarine, butter, and poultry mashes.

7.80 PROBLEMS IN TASTE DIFFERENCE TESTING 1. TEST ENVIRONMENT

Mitchell, John W. (G. Heileman Brewing Company, La Crosse, Wisconsin)
Food Technology 11, 476-477 (September 1957)

Empirical evidence is offered on the effect of distraction on sensitivity in the taste difference test. Conditions included (a) one subject testing, (b) two or more subjects testing at one time, (c) one or more subjects testing, with noise or distraction occurring. A lowering of sensitivity is shown between condition (a) and condition (b). A drop in sensitivity is also shown between condition (b) and (c). The influence of psychological and physical environments on the sensitivity of the difference test is demonstrated.

7.80 PROBLEMS IN TASTE DIFFERENCE TESTING 2. SUBJECT VARIABILITY DUE TO TIME OF THE DAY AND DAY OF THE WEEK

Mitchell, John W. (G. Heileman Brewing Company, La Crosse, Wisconsin)
Food Technology 11, 477-479 (September 1957)

The psychological and physical effect of time of testing on the sensitivity of the taste difference subject is shown. Data tend to support the theory that the subject does better during the earlier part of the week, poorer later in the week. As to the hour of the day, the data appear to indicate the middle of the day as optimal for testing. Both studies emphasize the fact that the various influences that may be affecting subject during any particular test are important and should be considered in interpreting sensory test data.

8.59 POLYRIBOPHOSPHATE, ISOLATED FROM THE LIVER OF A SQUID

Maki, Masahiro (Univ. Hirosaki)
Hirosaki Med. J. 7, 211-16 (1956)
Chemical Abstracts 51, 2184 (February 10, 1957)

A carbohydrate-phosphate fraction is isolated from the liver of a squid (Ommastrephes sloani pacificus). It is water-sol., nonreducing, and nondialyzable substance, consisting of ribose and phosphoric acid. The substance is easily depolymerized to dialyzable components by the addn. of 0.5N HCl, 0.5N NaOH, or ribonuclease.

8.59 STUDIES ON PIGMENTS OF MARINE ANIMALS

Nishibori, Kokichi (Notre Dame Seishin College, Okayama)
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 11, 708-717 (1957) (In English)

III. Echinochrome A from the spines of sand dollar, Echinarachnius mirabilis.--Echinochrome A has been isolated from the violet-brown spines of sand dollar (Echinarachnius mirabilis). The presence of echinochrome A in spines of sand dollar was fully confirmed.

IV. Astacene from the liver oil of cuttle fish, Ommastrephes sloani pacificus Streentrup.--The cuttle fish liver oil, which has been used for industrial use, has an intense red color, but there has been no report on the red pigment. Astacene has been isolated from this oil.

V. Carotenoids from the red muscle and the viscera of giant shield shell, Tugali gigas.--Two carotenoids, astacene and a carotenoid provisionally named "Tugali-carotenoid-X" were isolated from the red muscle of giant shield shell. Moreover, a carentoid, which appears to be identical with astacene, has been separated from the viscera of this shellfish.



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